

Workshop Manual OCTAVIA II 2004 ➤

1,2/77 kW TSI engine

Engine ID	CBZ B								
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Edition 12.09

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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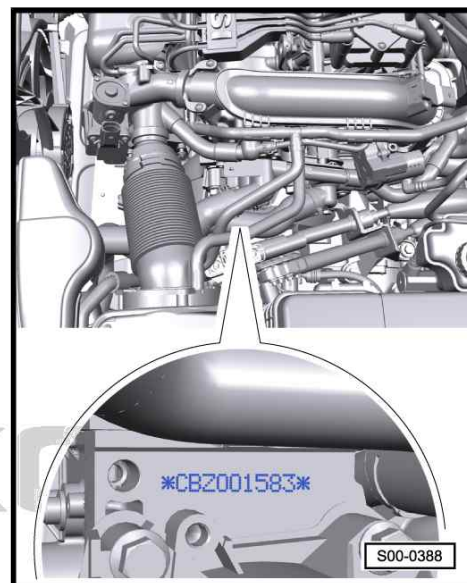
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00 – Technical data

1 Technical data

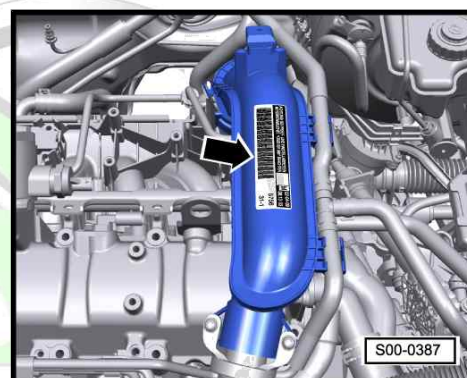
1.1 Engine number

The engine number ("engine identification character" and "serial number") is located on the engine directly above the joint separating the engine/gearbox.



In addition, the "engine identification character" and the "serial number" are indicated on the vehicle data sticker -arrow- which is located on the air guide pipe.

- ◆ As of letter "C", four-digit engine identification characters are used.
- ◆ The first 3 digits of the engine identification characters refer to the displacement and the mechanical construction of the engine. They are type-punched together with the serial number on the cylinder block.
- ◆ The fourth digit indicates the output and the torque of the engine and depends upon the engine control unit.



1.2 Engine characteristics

Engine identification characters		CBZB
Manufactured		02.10 ?
Emission levels in accordance with		EU5
Displacement	cm ³	1197
Power output	kW at rpm	77/5000
Torque	Nm at rpm	175/1550-4100
Bore	Ø mm	71,0
Stroke	mm	75,6
Compression		10:1
Cylinder / valves per cylinder		4 / 2
RON		unleaded 95 ¹⁾
Ignition system, fuel injection		Simos 10
Type of fuel preparation		Direct injection homogeneous
Knock control		1 sensor



Engine identification characters	CBZB
Lambda control	2 Lambda probes
3-way catalytic converter	yes
Exhaust gas recirculation	no
Intake manifold change-over	no
Camshaft adjustment	no
Secondary air system	no
Exhaust gas turbocharger	yes
Balancing shaft	no

1) At least 91 RON in exceptional cases, although engine output is reduced

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01 – Self-diagnosis

1 Self diagnosis, safety measures, cleanliness regulations, directions

1.1 Self-diagnosis

This repair group is no longer applicable.

For this use "Vehicle self-diagnosis", "Measuring method" and "Targeted fault finding" ⇒ Vehicle diagnosis, testing and information system VAS 5051.

1.2 Safety precautions when working on the fuel supply system



WARNING

- ◆ *The safety measures for the pressure reduction in the high pressure area of the fuel system must be observed ⇒ [page 4](#).*
- ◆ *The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.*

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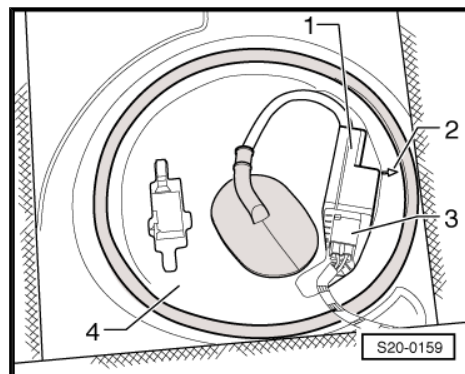


- ◆ The fuel delivery unit is activated by switching on the ignition and the door contact switch of the driver door. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit -1-.

**Caution**

When undertaking all installation work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*



When removing and installing the fuel gauge sender or the fuel delivery unit from a full or partly filled fuel tank, pay attention to the following points:

- ◆ The extraction hose of an exhaust extraction system which is switched on, must be positioned close to the assembly opening of the fuel tank in order to extract the released fuel vapours, even before the work is commenced. If no exhaust extraction system is available, a radial fan (motor not in air flow of fan) with a delivery volume of more than 15 m³/h must be used.
- ◆ Avoid skin contact with fuel!
- ◆ Wear fuel-resistant gloves!

1.3 Release pressure in the high pressure area of the fuel system

**WARNING**

- ◆ *The injection system consists of a high pressure part (maximum 12 MPa/120 bar) and a low pressure part (approx. 0.6 MPa/6 bar).*
- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described below.*

- Connect the ⇒ Vehicle diagnosis, testing and information system VAS 5051 and carry out the targeted function "remove high fuel pressure".
- Switch off ignition.

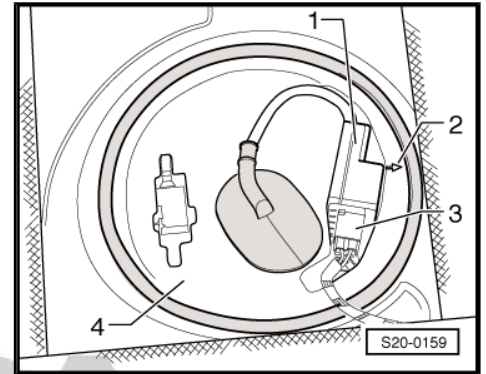
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- For safety reasons before opening the fuel system disconnect the plug from the fuel pump control unit -3-.



WARNING

The fuel lines are pressurized! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact. Before opening the high pressure part lay cleaning cloths around the connection point.



- Now lay a clean cleaning cloth around the connection point and carefully open it up, in order to reduce the remaining pressure of approx 0.6 MPa (6 bar). Collect the fuel which flows out.



Note

- ◆ *Interrogate the fault memory for the engine control unit at the end of the following work and delete all the fault entries.*
- ◆ *If the fault memory was erased, the readiness code must be generated ⇒ Vehicle diagnosis, testing and information system VAS 5051.*

1.4 Rules of cleanliness to observe when working on the fuel supply system

Carefully observe the following 5 rules for cleanliness when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connection points and their surroundings before releasing.
- ◆ Place removed parts on a clean surface and cover. Do not use fuzzy cloths!
- ◆ Carefully cover or close opened components if the repair is not completed immediately.
- ◆ Only install clean parts: Remove spare parts from their wrapping immediately before installing. Do not use any parts which have been stored unwrapped (e.g. in tool boxes).
- ◆ When the system is opened: Avoid using compressed air. Avoid moving the vehicle.

1.5 Safety measures to apply when working on the fuel injection and ignition system



WARNING

- ◆ ***The safety measures for the pressure reduction in the high pressure area of the fuel system must be observed ⇒ page 4 .***
- ◆ ***The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.***

Observe the following points to prevent injury to persons and/or damage to the injection and preheating system:

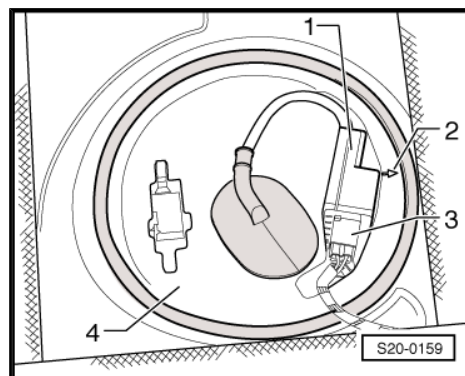


- ◆ Do not touch or remove ignition leads and ignition coils with power output stages with the engine running or at start speed.
- ◆ Ignition must be switched off before disconnecting and re-connecting the cables of the fuel injection and the ignition system as well as of the test equipment.
- ◆ If the engine must be operated at start speed without it starting, as for example, when checking the compression pressure, open lid of fuse carrier in the engine compartment and unplug fuse for Motronic current supply relay -J271- → Current flow diagrams and Fitting locations.
- ◆ The fuel delivery unit is activated by switching on the ignition and the door contact switch of the driver door. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit.

**Caution**

When undertaking all installation work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*



If test and measuring devices are required during test drives observe the following:

- ◆ Always secure the test and measuring devices on the rear seat and have a second person operate them there.
- ◆ If the test and measuring devices are operated from the passenger seat, the passenger can be injured by the release of the passenger airbag in the event of an accident.

1.6 General notes on the injection system

Repairing ignition → [page 183](#) .

- ◆ The engine control unit is equipped with a self-diagnosis system. Before repairs as well as trouble shooting first interrogate the fault memory. Also check the vacuum hoses and connections (unmetered air).
- ◆ Fuel hoses in the engine compartment must only be secured with spring-type clips → electronic catalogue of original parts. The use of clamp-type or screw-type clips is not allowed.
- ◆ A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- ◆ Do not use sealants containing silicone. Traces of silicone elements drawn in by the engine are not burnt in the engine and damage the lambda probe.
- ◆ If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted → Vehicle diagnosis, testing and information system VAS 5051.
- ◆ When opening the driver door the fuel pump is activated for 2 seconds in order to build up the pressure in the fuel system.



- ◆ Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Safety measures ⇒ [page 5](#) .

1.7 General notes on the ignition system

- ◆ Switch off the ignition before disconnecting and connecting the battery, as this may damage the 4AV control unit.
- ◆ The engine control unit is equipped with a self-diagnosis system; inspect ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ◆ A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- ◆ Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ◆ If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Safety measures ⇒ [page 5](#) .

Test data, spark-plugs ⇒ Maintenance ; Octavia II .

1.8 General instructions for charge air system



WARNING

When undertaking all installation work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *Ensure that there is adequate free access to all moving or hot components.*

**Caution**

In case a mechanical damage to the exhaust gas turbocharger is found, e.g. damage to the compressor wheel, it is not sufficient to only replace the turbocharger. In order to avoid consequential damage, perform the following tasks:

- ◆ *Clean all oil lines.*
- ◆ *Change the engine oil and replace the oil filter*
- ◆ *Inspect the air filter housing, the air filter element and the intake hoses for contaminations.*
- ◆ *Inspect the whole charge-air routing and the charge air cooler for foreign bodies.*

If foreign bodies are detected in the charge air system, the charge-air routing must be cleaned and the charge air cooler must be replaced.

- ◆ The charge-air system must be tight.
- ◆ Replace self-locking nuts.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before being installed.
- ◆ Only use clamps for securing the hose connections ⇒ Electronic Catalogue of Original Parts .
- ◆ Use pliers for spring strap clamps to fit the spring strap clips.
- ◆ Before connecting the oil feed line, fill the exhaust turbocharger via the connection fitting with engine oil.
- ◆ After installing the turbocharger, run engine at idling speed for about 1 minute to ensure that oil is supplied to the turbocharger.

1.9 Additional instructions when undertaking assembly work on the air-conditioning system

**WARNING**

Do not open the refrigerant circuit of the air conditioning system.

**Note**

In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

Steps which should be taken in order to remove and install the engine without opening the refrigerant circuit:

- Unscrew the holding clamp(s) on the refrigerant lines
- Remove AC compressor from the bracket ⇒ [page 23](#) .
- Mount the AC compressor in such a way that the refrigerant lines/hoses are not under tension.

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10 – Removing and installing engine

1 Removing and installing engine

1.1 Removing engine

Special tools and workshop equipment required

- ◆ Engine and gearbox jack , e.g. -V.A.G 1383 A-
- ◆ Double ladder , e. g. -VAS 5085-
- ◆ Engine mount -T10416-
- ◆ Pliers for spring strap clamps
- ◆ Catch pan e.g. -VAS 6208-



Note

- ◆ *The engine is removed downwards together with the gearbox.*
- ◆ *All cable straps that have been loosened or cut open when the engine was removed must be fitted again in the same location when the engine is installed again.*
- ◆ *Leave the ignition key in the ignition lock so that the steering lock does not click into place.*
- ◆ *Collect drained coolant in a clean container for reuse or proper disposal.*



Caution

When undertaking all installation work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*

Observe all safety measures and notes for assembly work on the fuel, injection and ignition system and the charge air system as well as rules for cleanliness ➔ [page 3](#) .

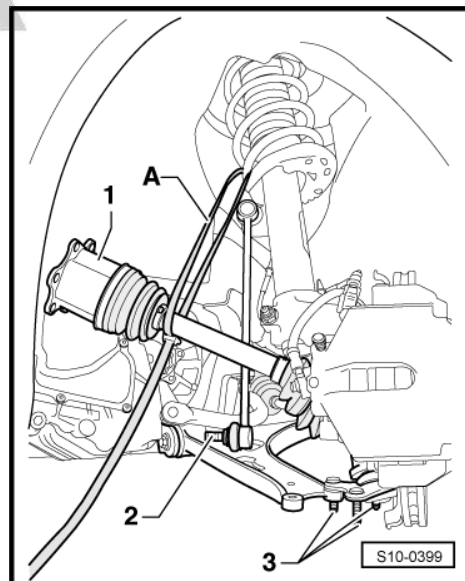


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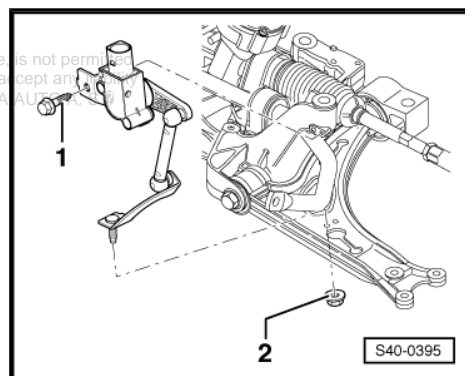
*Release pressure in the high pressure area of the fuel system
➔ [page 4](#) .*

- Remove air filter ➔ [page 161](#) .
- Before disconnecting the battery, if necessary remove the adapter for the anti-theft wheel bolts from the luggage compartment.

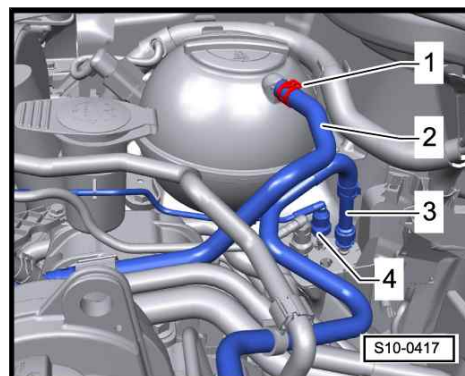
- Remove battery and battery tray ⇒ Electrical System ⇒ Rep. Gr. 27 .
- Remove the right and left wheelhouse liner ⇒ Body Work ⇒ Rep. Gr. 66 .
- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Drain the coolant from the cooling system ⇒ [page 99](#) .
- Remove right drive shaft ⇒ Chassis ⇒ Rep. Gr. 40 .
- Unscrew the left drive shaft from the flange shaft of the gear-box.
- Unscrew the nut of the left coupling rod -2- and press the coupling rod off the anti-roll bar.
- Unscrew the nuts from the left steering joint -3- and press the steering joint out of the suspension arm.



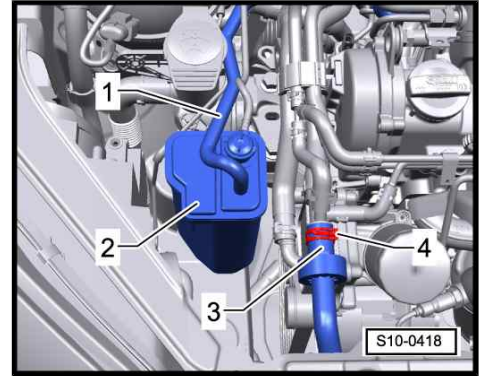
- Unscrew the nut -2- from the front left track control arm on installed front left vehicle level sensor -G78-.
- Turn steering to full left lock.
- Swivel the steering joint outwards and secure the drive shaft -1- with strap -A- in the wheelhouse.



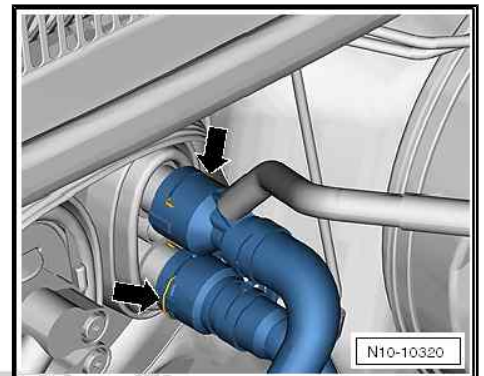
- Pull off top coolant hose -2- and bottom coolant hose from expansion reservoir.
- Disconnect the feed line -3- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.
- Detach the connecting hose -4- to the activated charcoal filter system.



- Remove the hose -1- from the activated charcoal filter and from the activated charcoal filter solenoid valve 1 -N80- .
- Remove activated charcoal filter -2-.
- Slacken the clamp -4- and detach the coolant hose -3- from the engine.



- Release the coolant hoses at the heat exchanger -arrows- and pull them off.



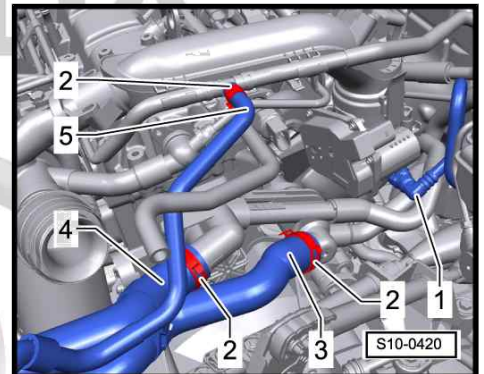
- Detach vacuum hose -1- from intake manifold.
- Slacken clamps -2- and detach coolant hoses -3 ... 5-.

For models with automatic gearbox

- Remove the selector lever control cable from the gearbox ⇒ Gearbox ⇒ Rep. Gr. 34 .

For vehicles with manual gearbox

- Remove shift mechanism from gearbox ⇒ gearbox ⇒ Rep. Gr. 34 .
- Remove hydraulic clutch control from gearbox ⇒ Gearbox ⇒ Rep. Gr. 34 .



WARNING

After removing the slave cylinder or after separating the hydraulic line, do not depress the clutch pedal.

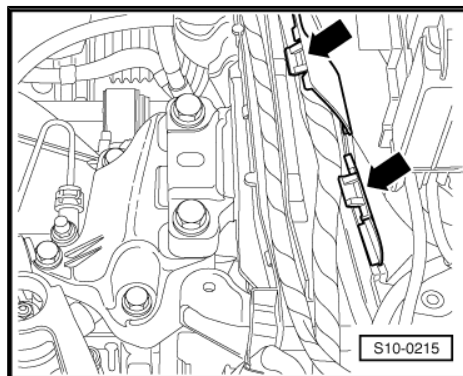
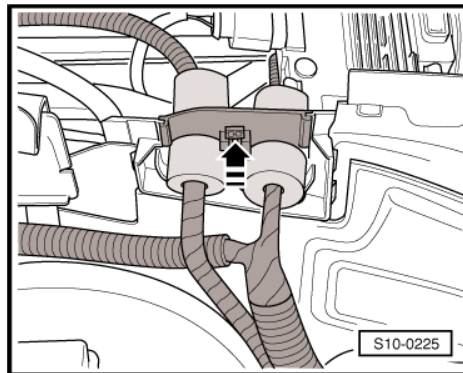
- Remove/unclamp all electrical lines from the gearbox, generator and starter motor and uncover them.
- Remove/unclamp all other necessary electrical cables from the engine.
- Disconnect the vacuum and bleeder hoses from the engine.
- Disconnect the plug from the thermal switch and the radiator fan.
- Disconnect the plug of the engine wiring harness from the engine control unit (front plug) ⇒ [page 176](#) .

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- Release guide for engine wiring harness and pull out upwards -arrow-.

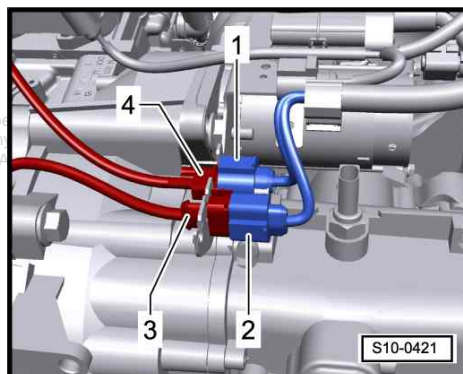
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- Open all fuses for the engine wiring harness at frame side rail -arrows-.
- Open other attachments of the engine wiring harness, remove engine wiring harness and attach to engine.
- Attach the cables with a cable strap at the engine.



- Disconnect plugs -1 and 2-.
- Remove pre-exhaust pipe Pos. 9 ➔ [page 178](#).

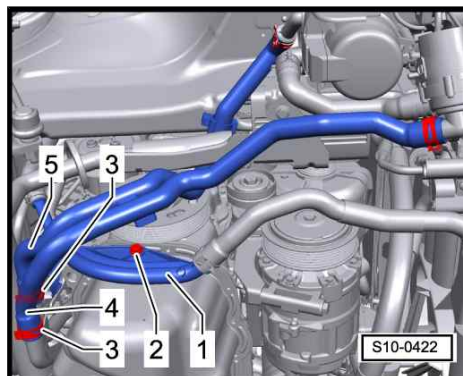
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- Unscrew the screw -2- and remove the bottom coolant pipe -1-.

Vehicles with auxiliary heating.

- Slacken clamps -3- and pull off the coolant hoses -4 and 5-.





- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

Continued for all vehicles

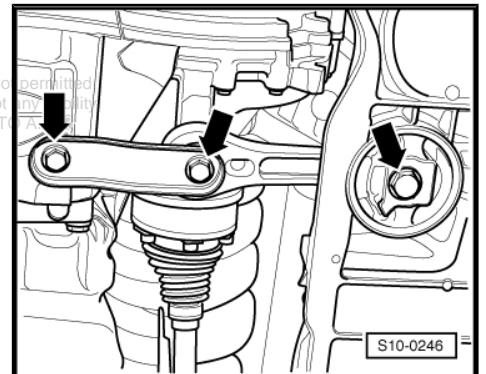
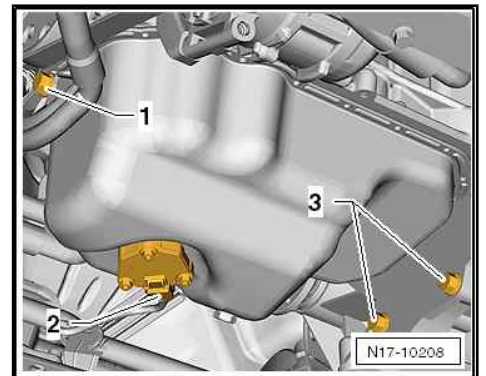
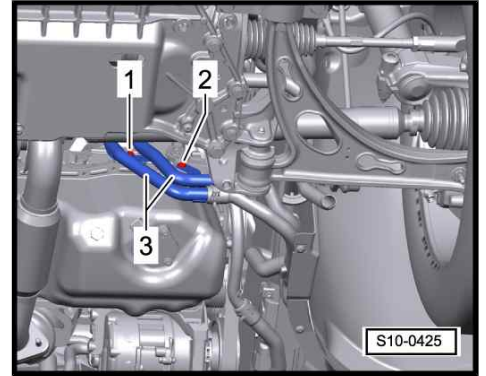
ŠKODA

- Disconnect plug -2- from oil level and oil temperature sender -G266- .
- Remove the hold-down device for the cable guide of the oil level and oil temperature sender -G266- from the assembly carrier at the front and place down on the assembly carrier.

- Unbolt the pendulum support -arrows-.

For vehicles with air conditioning

- Remove V-ribbed belt ➔ [page 26](#) .





- Disconnect connector -1- for magnetic coupling at AC compressor.

**WARNING**

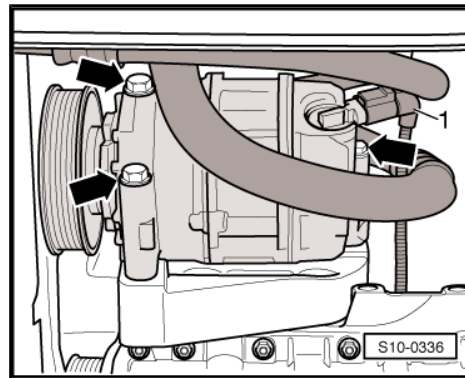
Risk of injury through refrigerant.

- ◆ *Do not open the refrigerant circuit of the air conditioning system.*

**Caution**

Risk of damaging refrigerant lines and hoses.

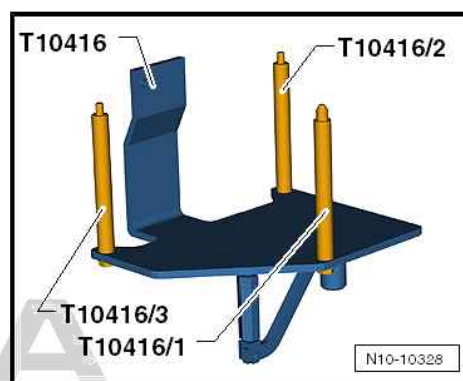
- ◆ *Do not over-tension, buckle or bend refrigerant lines and hoses.*



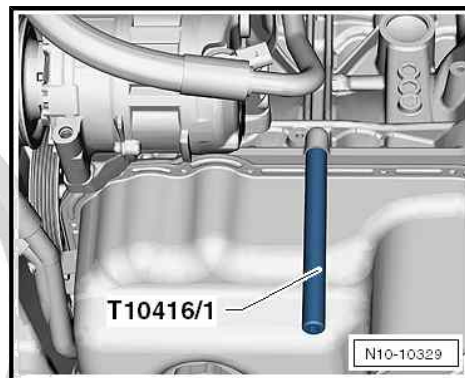
- Release screws -arrows- for AC compressor.
- Attach AC compressor to lock carrier.

Continued for all vehicles

In order to lower the engine with the gearbox, the engine holder -T10416- with the adapters -/1-, -/2- and -/3- is required.



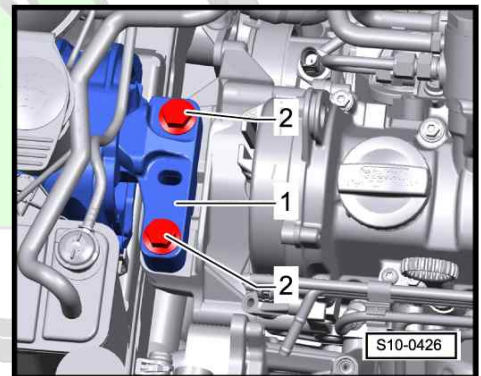
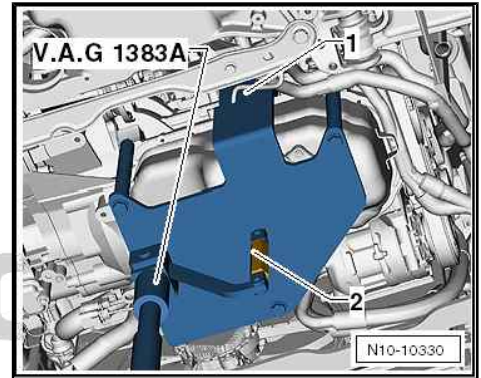
- Turn the adapter T10416/1 up to the stop in the cylinder block.



- Fit the engine mount -T10416- with the adapters -/2- and -/3- to the cylinder block.
- Attach the engine mount -T10416- with the screw -1- by hand at the cylinder block.
- Tighten all screws on the engine mount -T10416- to 20 Nm.
- Place the engine and gearbox jack - V.A.G 1383 A- on the engine mount -T10416- and slightly raise the engine with the gearbox.

i Note

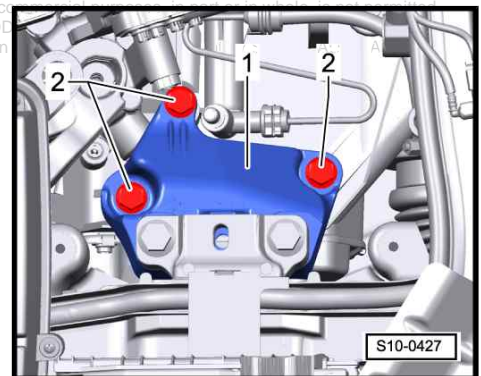
- ◆ Check whether all hose and line connections between engine, gearbox and body are released, if necessary release them.
- ◆ Use the double ladder -VAS 5085- for removing the fixing bolts.
- Release the screws -2- of the assembly bracket at the engine.



- Release the screws -2- of the assembly bracket at the gearbox.

i Note

- ◆ The engine/gearbox assembly should be lowered with the help of a second mechanic.
- ◆ When lowering carefully guide the engine/gearbox assembly, in order to avoid damage.
- Pull engine/gearbox unit as far forward as possible and lower carefully and slowly downwards.
- Remove the gearbox from the engine ⇒ gearbox ⇒ Rep. Gr. 34 .



1.2 Securing the engine to the assembly stand

Special tools and workshop equipment required

- ◆ Lifting device -MP 9-201 (2024 A)-
- ◆ Engine mount -MP 1-202-
- ◆ Assembly stand -MP 9-101-
- ◆ Adapter -MP1-202/8-
- ◆ Adapter -MP1-202/9-
- ◆ Workshop crane , e.g. -VAS 6100-

Work procedure

- Separate engine from gearbox.
- Attach lifting device -MP9-201 (2024 A)- at workshop crane (e.g. -VAS 6100-) and at engine as shown. (The figure shows the 1.4 ltr./90 kW TSI Engine; the engine mounting is identical).

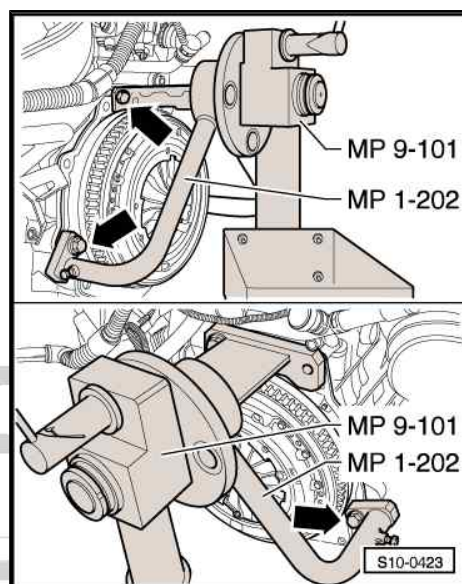
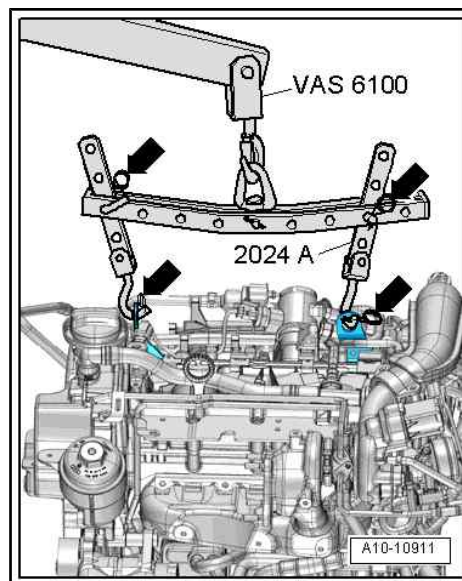


WARNING

Use securing pins on the hooks and rig pins to prevent release.

Use securing pins on the hooks and rig pins -arrows-, in order to avoid injuries and damages to the engine.

- Lift off engine with installed engine mount -T10416- with workshop crane (e.g. -VAS 6100-) from engine/gearbox jack - V.A.G 1383 A- .
- Remove engine mount -T10416- .
- Screw engine mount -MP 1-202- with adapters -MP1-202/8- and -MP1-202/9- to engine -arrows- and secure to the assembly stand -MP 9-101- .



1.3 Installing the engine

Special tools and workshop equipment required

- ♦ Double ladder , e. g. -VAS 5085 -
- ♦ Catch pan for workshop crane , e.g. -VAS 6208 -
- ♦ Pliers for spring strap clamps
- ♦ Grease -G 000 100-
- ♦ Cable strap

Condition

- Engine and gearbox with mounted engine mount -T10416- to engine and gearbox jack -V.A.G 1383 A- .

Work procedure

Installation is carried out in the reverse order. Pay attention to the following:

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Caution

When undertaking all installation work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*



Note

- ◆ *All cable straps should be fitted on again in the same place when installing.*
- ◆ *Secure all hose connections with hose clamps ⇒ Electronic Catalogue of Original Parts .*
- ◆ *When performing installation work replace the self-locking nuts and screws.*
- ◆ *Replace screws which have been tightened firmly to a torquing angle as well as gasket rings and seals.*

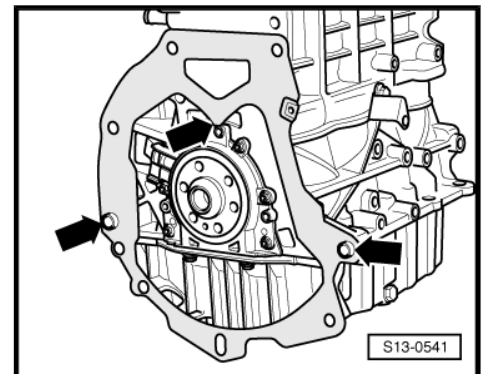
Observe all safety measures and notes for assembly work on the fuel, injection and ignition system and the charge air system as well as rules for cleanliness ⇒ [page 3](#) .

- Check whether the dowel sleeves for centering the engine/gearbox are present in the cylinder block; insert if necessary.
- Ensure that the intermediate plate has been inserted on the sealing flange and is pushed onto the dowel sleeves -arrows-.

For vehicles with manual gearbox

- Clean the serration on the drive shaft and if the clutch disc has been used clean the hub serration, remove corrosion and only apply a very thin layer of grease -G 000 100- to the serration on the drive shaft. Subsequently move the clutch disc up and down on the drive shaft until the hub fits smoothly on the shaft. Always remove excess grease.
- After installing the coupling, check the centering of the clutch disc ⇒ gearbox ⇒ Rep. Gr. 30 .
- Check the clutch release bearing for wear. Replace release bearing if worn ⇒ gearbox ⇒ Rep. Gr. 30 .

For models with automatic gearbox



- Replace the needle bearing -arrow- in the crankshaft
⇒ [page 50](#) .
- Attach the selector lever control cable at the gearbox ⇒ Gearbox ⇒ Rep. Gr. 34 .

Continued for all vehicles

- Screw on gearbox to engine ⇒ gearbox ⇒ Rep. Gr. 34 .
- When installing the engine/gearbox assembly, ensure clearance to the assembly carrier, AC compressor as well as to the radiator fans.
- Tighten the new screws by hand for attaching the engine/gearbox assembly at the engine and gearbox mounts.
- Adjust assembly bracket ⇒ [page 20](#) and tighten screws ⇒ [page 19](#) .
- Install pendulum support ⇒ [page 19](#) .
- Install drive shafts ⇒ Chassis ⇒ Rep. Gr. 40 .

For vehicles with air conditioning

- Install AC compressor ⇒ [page 23](#) .
- Install the V-ribbed belt ⇒ [page 26](#) .

Continued for all vehicles

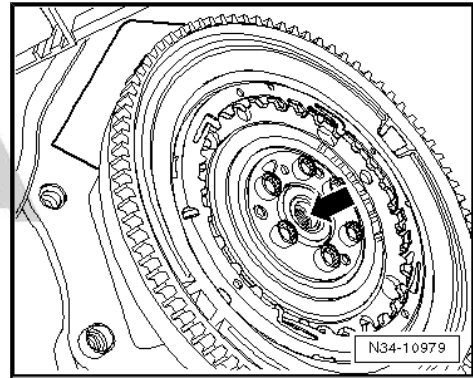
- Install slave cylinder ⇒ Gearbox ⇒ Rep. Gr. 30 .
- Attach shift mechanism and adjust if necessary ⇒ Gearbox ⇒ Rep. Gr. 34 .
- Install the engine wiring harness and connect to the engine control unit ⇒ [page 176](#) .
- Install exhaust system ⇒ [page 178](#) .
- Install the battery and pay attention to the necessary work after re-connecting the battery ⇒ Electrical System ⇒ Rep. Gr. 27 .
- Checking the oil level ⇒ Maintenance ; Octavia II .
- Top up and bleed cooling system ⇒ [page 99](#) .
- Interrogate all fault memories and delete all fault entries, which are caused by removing and installing the engine ⇒ Vehicle diagnosis, testing and information system VAS 5051.

After deleting the fault memory of the engine control unit the readiness code must be re-generated.

- Perform a test drive.
- Then perform a vehicle system test and if necessary eliminate the resulting faults.

Tightening torques

Component		Nm
Screws/nuts	M6	10
	M7	13
	M8	20
	M10	45
	M12	60
deviations:		
Engine/gearbox connecting screws ⇒ gearbox ⇒ Rep. Gr. 34		
Screws for assembly bracket ⇒ page 19		



2 Assembly bracket

2.1 Unit mounting - summary of components

1 - Gearbox support bracket

2 - Screw

- ☐ Tightening torque ⇒ gearbox ⇒ Rep. Gr. 34

3 - Unit mounting for engine

4 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace

5 - Bracket for activated charcoal filter

6 - 9 Nm

7 - 9 Nm

8 - 20 Nm + torque a further 90° (1/4 turn)

- ☐ replace

9 - 20 Nm + torque a further 90° (1/4 turn)

- ☐ replace

10 - Connecting part

11 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace

12 - 60 Nm + torque a further 90° (1/4 turn)

- ☐ replace

13 - Pendulum support

- ☐ removing: first unscrew screw -14-, then screws -15-

- ☐ installing: first tighten screws -15-, then screw -14-

14 - 100 Nm + torque a further 90° (1/4 turn)

- ☐ replace

15 - Screws

- ☐ replace

- ☐ Strength category 8.8: 40 Nm + torque a further 90° (1/4 turn).

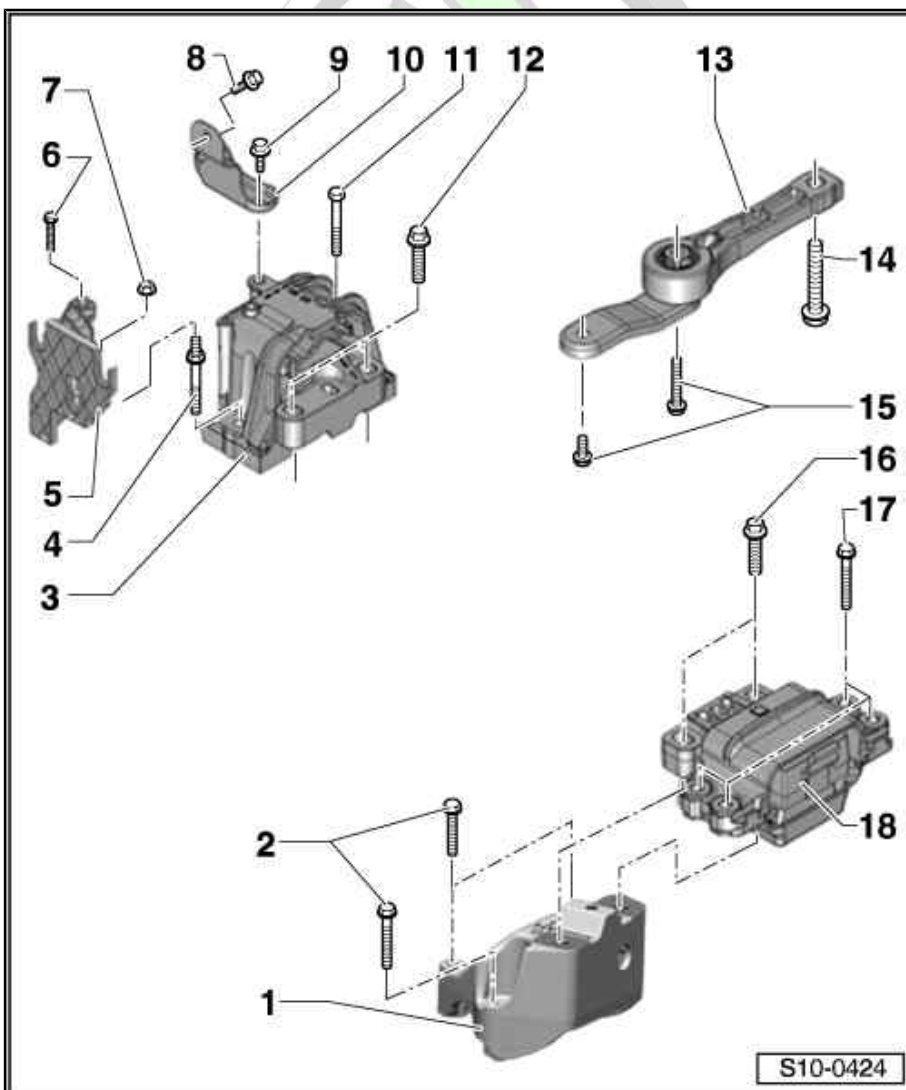
- ☐ Strength category 10.9: 50 Nm + torque a further 90° (1/4 turn).

16 - 60 Nm + torque a further 90° (1/4 turn)

- ☐ replace

17 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace



S10-0424



18 - Unit mounting for gearbox

2.2 Checking and adjusting the assembly bracket

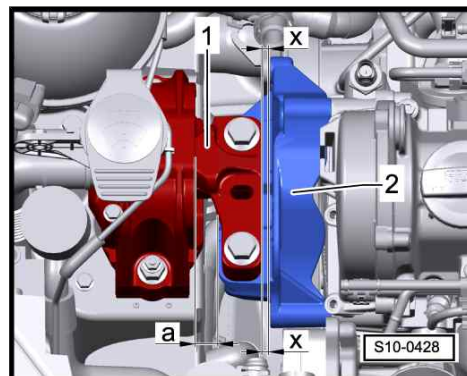
2.2.1 Checking the assembly bracket

- Check dimensions on the right hanger for engine/gearbox unit:
- Between engine bracket and engine support there must be a distance -a- = 10 mm.
- The cast iron edge on the engine support -2- must be parallel to the supporting arm -1- the dimension -x- must be the same at the front and rear.



Note

The distance -a- can also be checked e.g. with suitable round bars.



Only if there is an acoustic complaint (engine or gearbox knock on the frame side rail when cornering) and the dimension -a- is not 10 mm:

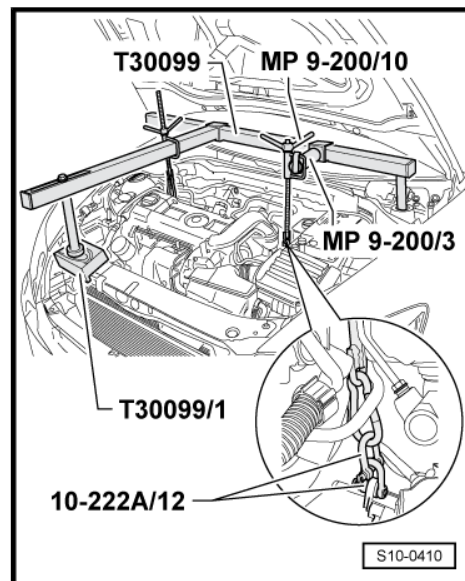
- Adjust the assembly bracket ⇒ [page 20](#) .

2.2.2 Adjusting the unit mounting

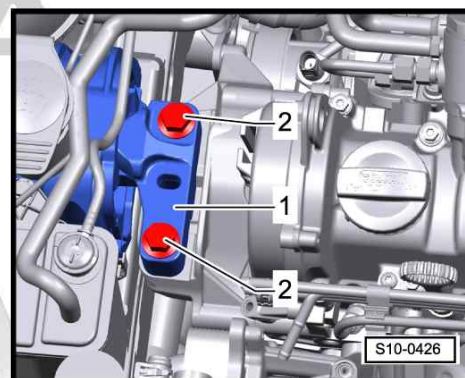
Special tools and workshop equipment required

- ◆ Supporting device -T30099-
- ◆ Shim -T30099/1-
- ◆ Adapter -MP9-200/3 (10-222A/3)-
- ◆ Lifting eye -10-222A/12-
- ◆ Snap hook
- Remove battery and battery tray ⇒ Electrical System ⇒ Rep. Gr. 27 .
- Remove the cooling water tank cover ⇒ Body Work ⇒ Rep. Gr. 66 .

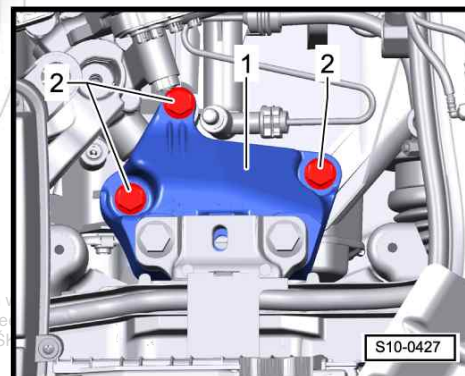
- Install supporting device -T30099- and support engine in fitting position. (The figure shows the version with the 1.4 ltr./90 kW TSI Engine; the engine mounting is identical).
- Uniformly pre-tension the engine/gearbox assembly at both spindles, but do not raise.



- Release the screws -2- of the assembly bracket at the engine.



- Slightly loosen the screws -2- of the unit mounting at the gear-box (less than 1 revolution).
- Successively replace all the screws of the assembly bracket (as long as it has not already been performed when installing the engine) and insert these loosely.



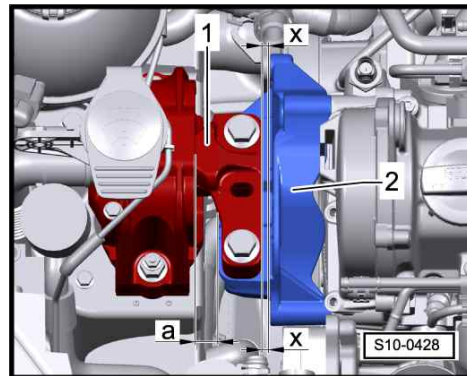
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- Move the engine/gearbox assembly with an assembly lever between the supporting arm of the engine mount -1- and the engine support -2- until the following dimensions are set:
- Between engine bracket and engine support there must be a distance -a- of 10 mm.
- The cast iron edge on the engine support -2- must be parallel to the supporting arm of the engine mount -1-; the dimension -x- must be the same at the front and rear.

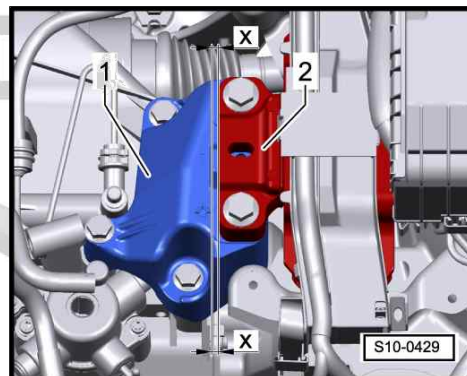
**Note**

The distance -a- = 10 mm can be checked e.g. with suitable round bars.



- Tighten the screws for the engine side assembly bracket
⇒ [page 19](#).
- Make sure that on the gearbox side the edges of the supporting arm of the gearbox mount -2- and the gearbox support -1- are parallel.
- The dimension -x- must be the same on both mount sides.
- Tighten the screws for the gearbox side assembly bracket
⇒ [page 19](#).

Further installation occurs in reverse order.



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13 – Crankgear

1 V-ribbed belt drive

1.1 V-ribbed belt - Summary of components

1.1.1 Summary of components - Vehicles without air conditioning

1 - V-ribbed belt

- ☐ Routing of the ribbed V-belt [⇒ page 24](#)
- ☐ mark the direction of rotation with chalk or a felt-tip pen before removing
- ☐ check for wear
- ☐ do not kink
- ☐ removing and installing [⇒ page 26](#)

2 - Fixing screw

- ☐ for crankshaft belt pulley
- ☐ replace
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ tighten [⇒ page 41](#)

3 - Belt pulley for crankshaft

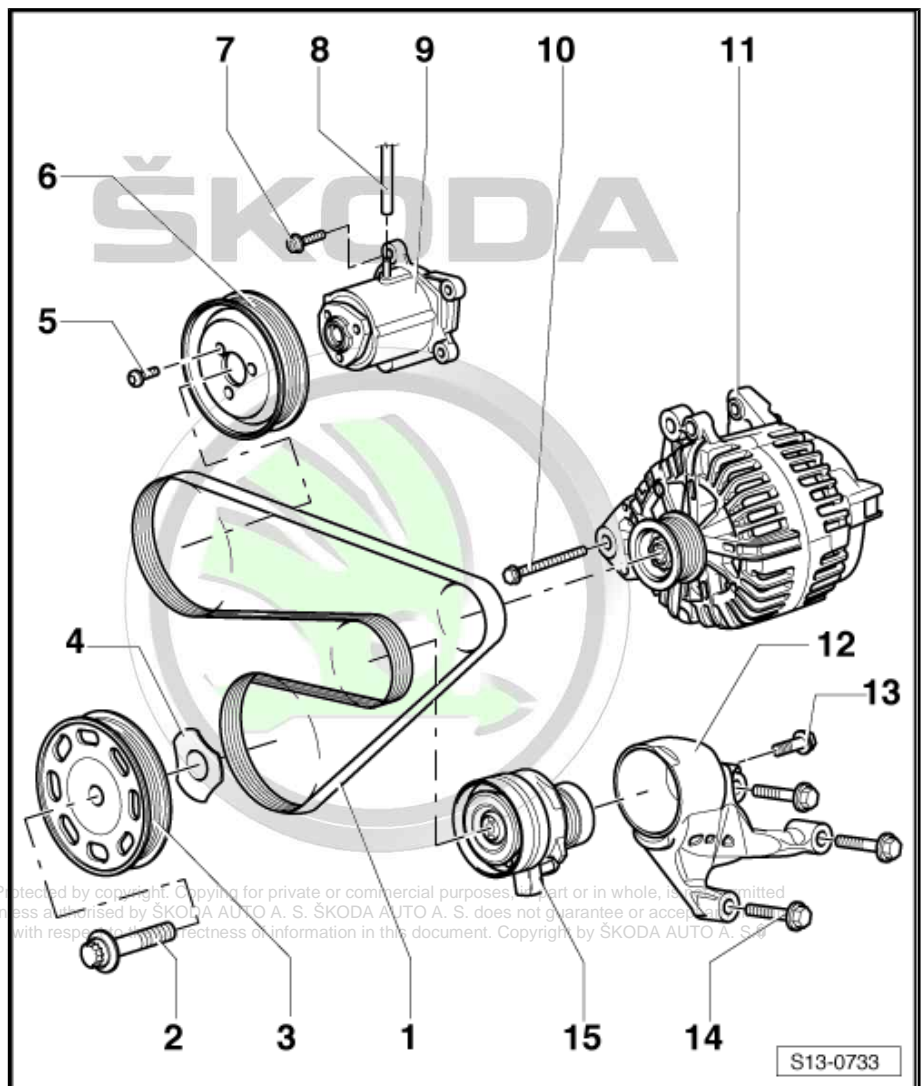
- ☐ Clamping surfaces must be free of oil and grease.

4 - Diamond coated washer

- ☐ replace

5 - 20 Nm

- ☐ When loosening and tightening, counterhold with the wrench for the water pump and power-assisted steering -MP 1-308 (V.A.G 1590)- to this end rework wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- [⇒ page 103](#)



6 - Belt pulley - coolant pump

- ☐ removing and installing [⇒ page 41](#)

7 - 9 Nm

8 - Vacuum hose

- ☐ to solenoid valve for coolant circuit -N492- at intake manifold

9 - Coolant pump

- ☐ removing and installing [⇒ page 104](#)

**10 - 25 Nm****11 - AC generator**

- ☐ removing and installing ⇒ Electrical System ⇒ Rep. Gr. 27
- ☐ to facilitate positioning, drive the threaded bushings for the screws at the generator slightly backwards

12 - Bracket for auxiliary units

- ☐ for tensioning device and AC compressor
- ☐ removing and installing ⇒ [page 29](#)

13 - 40 Nm + torque a further 90° (1/4 turn)

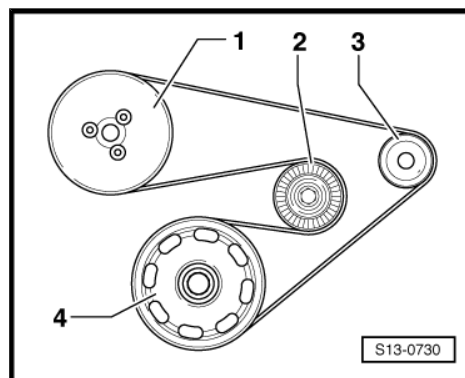
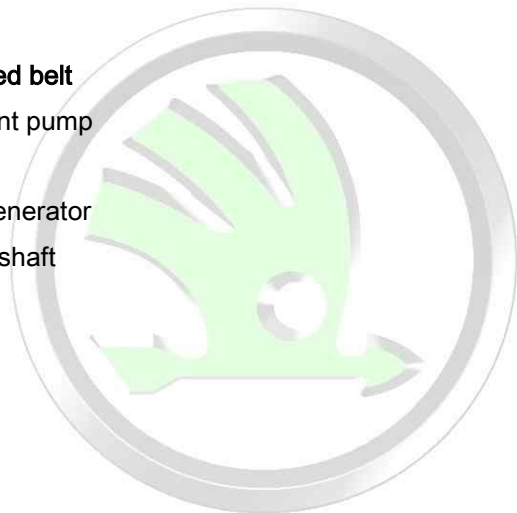
- ☐ replace

14 - 25 Nm**15 - Tensioning device for V-ribbed belt**

- ☐ swivel tensioning device for V-ribbed belt with wrench to slacken the V-ribbed belt
- ☐ Secure tensioning device with a 4 mm hexagon wrench or locating pin -T10060 A- .
- ☐ to remove, release screw -Pos. 12-

Routing of the V-ribbed belt

- 1 - Belt pulley - coolant pump
- 2 - Tensioning pulley
- 3 - Belt pulley - AC generator
- 6 - Belt pulley - crankshaft



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1.1.2 Summary of components - Vehicles with air conditioning

1 - V-ribbed belt

- ☐ Routing of the ribbed V-belt ⇒ [page 26](#)
- ☐ mark the direction of rotation with chalk or a felt-tip pen before removing
- ☐ check for wear
- ☐ do not kink
- ☐ removing and installing ⇒ [page 26](#)

2 - Fixing screw

- ☐ for crankshaft belt pulley
- ☐ replace
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ tighten ⇒ [page 41](#)

3 - Belt pulley for crankshaft

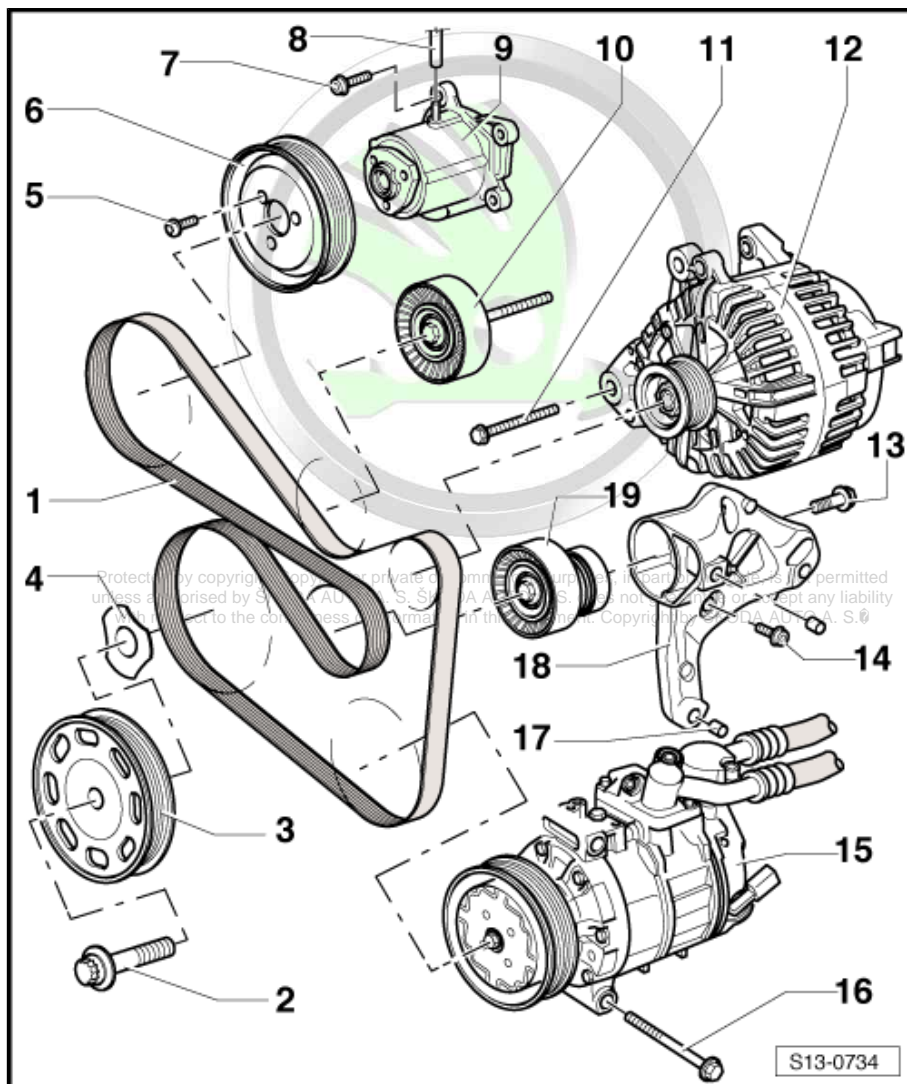
- ☐ Clamping surfaces must be free of oil and grease.

4 - Diamond coated washer

- ☐ replace

5 - 20 Nm

- ☐ When loosening and tightening, counterhold with the wrench for the water pump and power-assisted steering -MP 1-308 (V.A.G 1590)- to this end rework wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- ⇒ [page 103](#)



6 - Belt pulley - coolant pump

- ☐ removing and installing ⇒ [page 41](#)

7 - 9 Nm

8 - Vacuum hose

- ☐ to solenoid valve for coolant circuit -N492- at intake manifold

9 - Coolant pump

- ☐ removing and installing ⇒ [page 104](#)

10 - 25 Nm

11 - Guide pulley, 40 Nm

12 - AC generator

- ☐ removing and installing ⇒ Electrical System ⇒ Rep. Gr. 27
- ☐ to facilitate positioning, drive the threaded bushings for the screws at the generator slightly backwards

13 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace

14 - 25 Nm

15 - AC compressor

- ❑ removing and installing ⇒ Heating, Air Conditioning ⇒ Rep. Gr. 87

16 - 25 Nm

17 - Fitting sleeve

18 - Bracket for auxiliary units

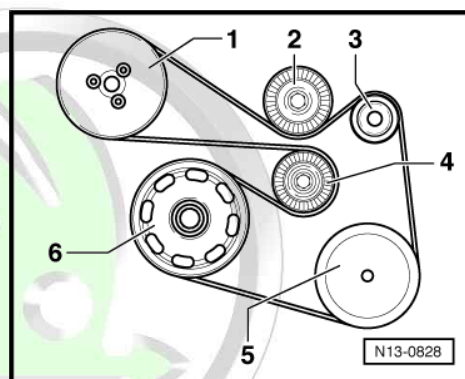
- ❑ for tensioning device and AC compressor
- ❑ removing and installing ⇒ [page 29](#)

19 - Tensioning device for V-ribbed belt

- ❑ swivel tensioning device for V-ribbed belt with wrench to slacken the V-ribbed belt
- ❑ Secure tensioning device with a 4 mm hexagon wrench or locating pin -T10060 A- .
- ❑ to remove, release screw -Pos. 12-

Routing of the V-ribbed belt

- 1 - Belt pulley - coolant pump
- 2 - Guide pulley
- 3 - Belt pulley - AC generator
- 4 - Tensioning pulley
- 5 - Belt pulley - AC compressor
- 6 - Belt pulley - crankshaft



1.2 Removing and installing V-ribbed belt

Special tools and workshop equipment required

- ◆ Locking pin -T10060 A-

Removing

- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .

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Caution

Risk of damage through reversing the rotation direction of an already used V-ribbed belt.

- ◆ ***Mark the direction of rotation with chalk or a felt-tip pen for the re-installation before removing the V-ribbed belt.***

For vehicles with air conditioning

- Loosen the V-ribbed belt by swivelling the tensioning device using the ring spanner SW 16 -in direction of arrow-.
- Interlock the tensioning element with the locking pin -T10060 A- .

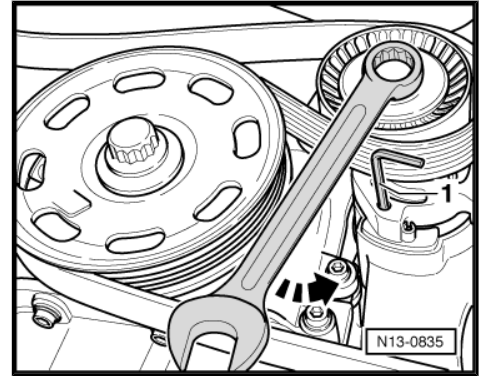
For vehicles without air conditioning

- Swivel the tensioning device with the locating pin -T10060 A- and lock, the V-ribbed belt is therefore slackened.

Continued for all vehicles

- Remove the V-ribbed belt.

Install



Note

- ◆ *Before fitting the V-ribbed belt make sure that all assemblies (AC generator, AC compressor, coolant pump) are securely mounted.*
- ◆ *Pay attention to the correct position and rotation direction of the V-ribbed belt in the belt pulley when installing it.*

- First of all place the ribbed V-belt onto the crankshaft - belt pulley. Then shift the belt onto the tensioning roller.

Further installation occurs in reverse order to removal.

- Start engine and check ribbed V-belt run.

1.3 Removing and installing bracket for top auxiliary units

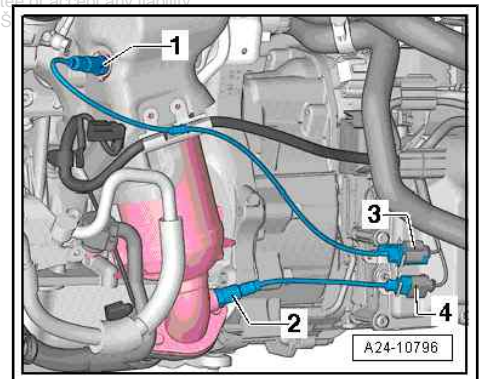
Removing

Special tools and workshop equipment required

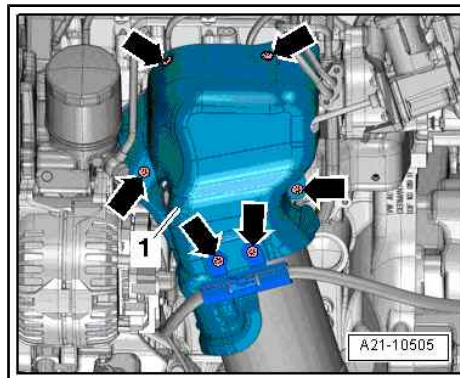
- ◆ Catch pan , e.g. -VAS 6208-
- ◆ Hose binding claw

Removing

- Remove V-ribbed belt ⇒ [page 26](#) .
- Remove alternator ⇒ Electrical System ⇒ Rep. Gr. 27 .
- Drain the coolant from the cooling system ⇒ [page 99](#) .
- Remove lambda probe -G39- -1- .



- Unscrew screws -arrows- and remove heat shield -1-.



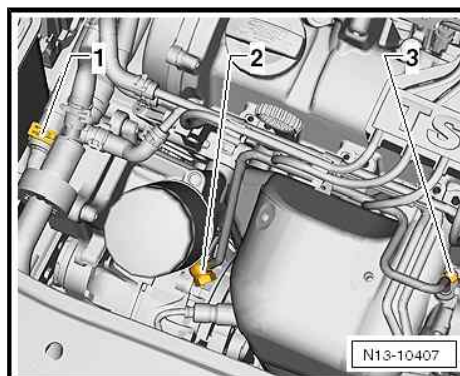
- Open the spring strap clamp -1- with the hose binding claw and detach the coolant hose.



Note

When removing the oil feed line, make sure that the oil does not penetrate into the generator! Therefore, cover the generator with a clean cloth!

- Unscrew hollow screw -2- and fixing screw -3- and remove the oil feed line.



- Unscrew fixing screws -1- and remove bracket.

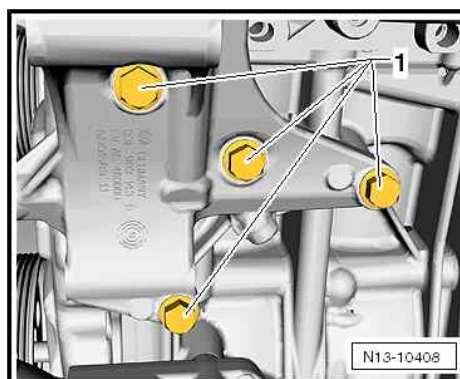
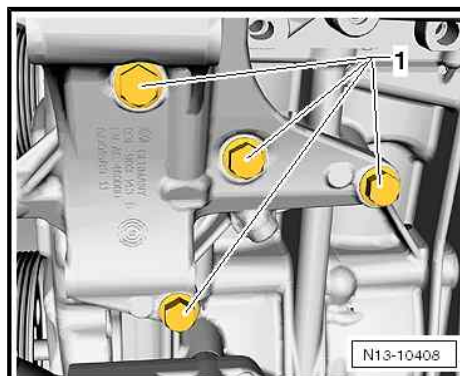
Install

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- Fit the bracket for auxiliary units to the cylinder block.
- Tighten fixing screws -1- to 25 Nm.
- Install oil feed line.

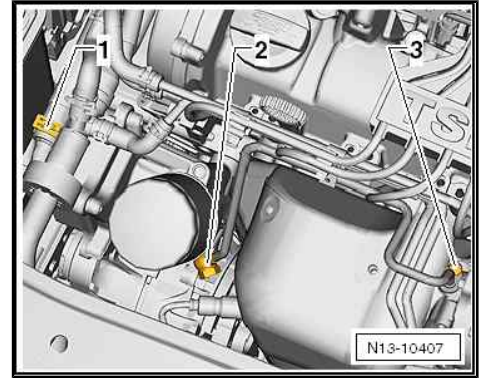
Tightening torques:

Component	Nm
Fixing screw to exhaust turbocharger	8 Nm
Hollow screw (replace gasket rings)	20 Nm



- Connect the coolant hose -1- and attach it to the engine oil cooler and remove the hose clamp -MP7-602 (3094)- .
- Top up and bleed cooling system ➔ [page 99](#) .
- Inspect coolant level in the expansion reservoir, top up with coolant if necessary.
- Install alternator ➔ Electrical System ➔ Rep. Gr. 27 .
- Install the V-ribbed belt ➔ [page 26](#) .

The further assembly is carried out in reverse order to disassembly.



1.4 Removing and installing bracket for bottom auxiliary units

Removing

- Remove V-ribbed belt ➔ [page 26](#) .
- Remove alternator ➔ Electrical System ➔ Rep. Gr. 27 .



WARNING

Risk of injury through refrigerant.

- ◆ *Do not open the refrigerant circuit of the air conditioning system.*



Caution

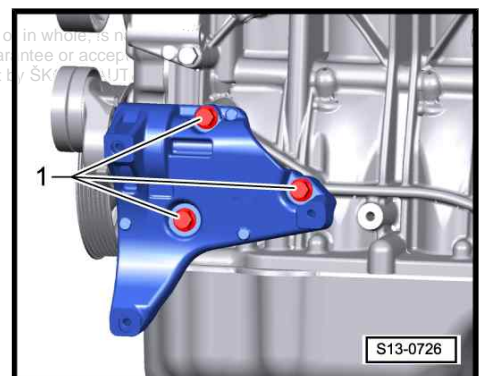
Risk of damaging refrigerant lines and hoses.

- ◆ *Do not over-tension, buckle or bend refrigerant lines and hoses.*

- Remove AC compressor from the bracket ➔ [page 23](#) .
- Mount the AC compressor in such a way that the refrigerant lines/hoses are not under tension.
- Unscrew fixing screws -1- and remove holder with tensioning element.

Install

- Fit the bracket for auxiliary units to the cylinder block.

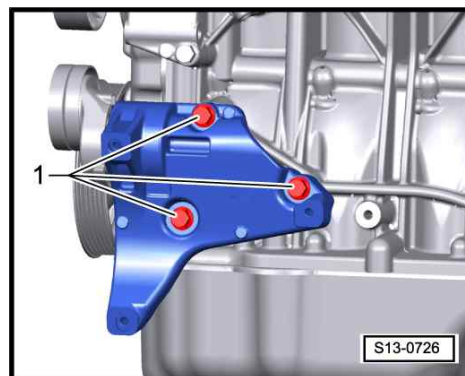




- Tighten fixing screws -1- to 25 Nm.

Tightening torque of tensioning device: ➔ [page 23](#)

The further assembly is carried out in reverse order to disassembly.



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2 Camshaft drive

2.1 Camshaft drive - Summary of components

Note

- ◆ *Before assembly oil all bearing and contact surfaces.*
- ◆ *If considerable quantities of metal swarf or abrasion is found when carrying out engine repairs, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:*
 - Carefully clean the oil galleries.
 - Replace oil spray jets.
 - Replace engine oil cooler.
 - Replace oil filter.

1 - Cylinder head with cylinder head cover

- ☐ Removing and installing cylinder head
⇒ [page 80](#)
- ☐ Removing and installing cylinder head cover
⇒ [page 73](#)
- ☐ Do not rework the sealing surface

2 - Cylinder block

- ☐ Disassembling and assembling pistons and conrods ⇒ [page 52](#)

3 - Bracket for bottom auxiliary units

- ☐ for tensioning device and AC compressor
- ☐ removing and installing
⇒ [page 29](#)

4 - 25 Nm

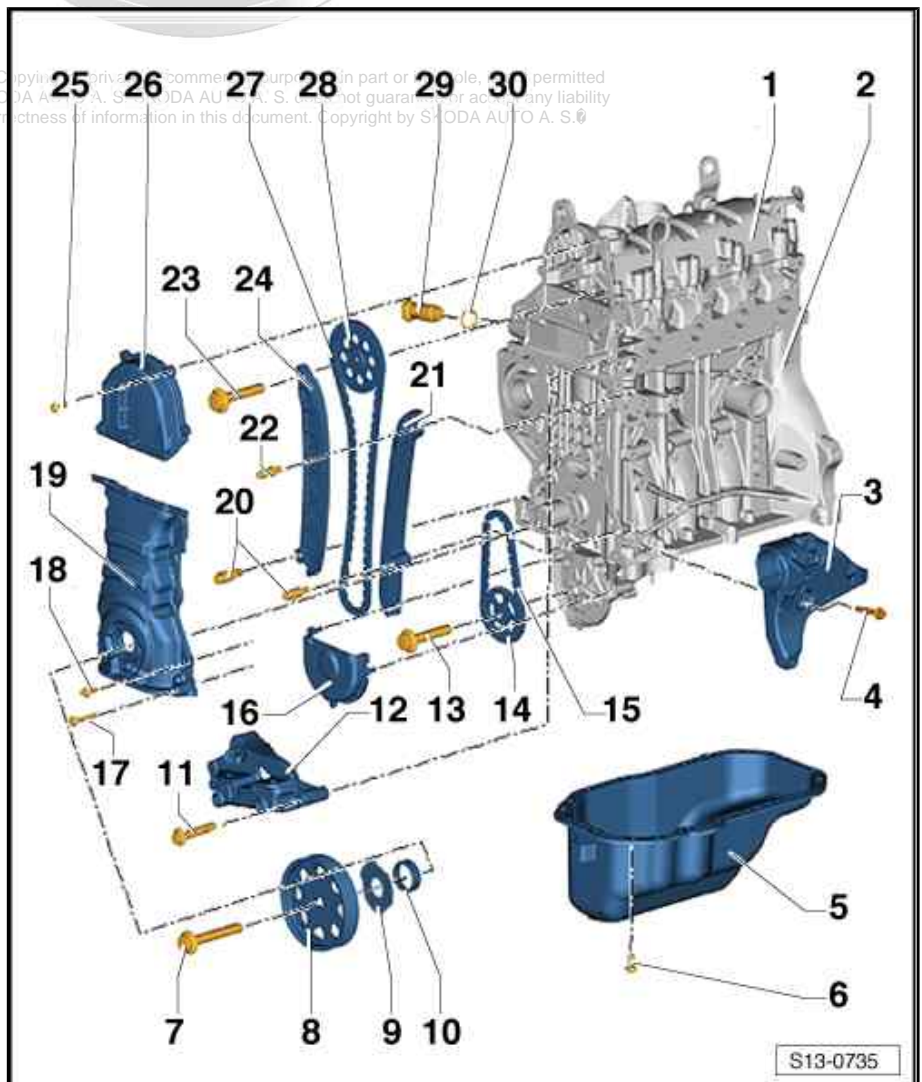
5 - Oil pan

- ☐ removing and installing
⇒ [page 93](#)
- ☐ fit with silicone sealant D 176 600 A1

6 - 13 Nm

7 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ The clamping surface of the fixing screw must be free of grease and oil.





- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -3415- to prevent it from turning

8 - Belt pulley

- ☐ Pay attention to tightening process ⇒ [page 41](#)
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Secure belt pulley with counterholder -T30004 (3415)- with bolts -T30004/2 (3415/2)- to prevent it from turning

9 - Diamond coated washer

- ☐ replace

10 - Sealing ring

- ☐ replace
- ☐ removing and installing ⇒ [page 40](#)

11 - 50 Nm**12 - Engine support bracket****13 - 20 Nm + torque a further 90° (1/4 turn)**

- ☐ replace

14 - Sprocket

- ☐ for oil pump drive
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Lock chain sprocket with counterholder -T10172-

15 - Drive chain for oil pump

- ☐ mark running direction (installed position) before removing

16 - Bottom cover**17 - 5 Nm + torque a further 30°**

- ☐ Screw: M6x40

18 - 5 Nm + torque a further 30°

- ☐ Screw: M6x20

19 - Bottom timing case

- ☐ removing and installing ⇒ [page 35](#)

20 - Bearing bolt - 18 Nm**21 - Guide rail**

- ☐ for timing chain

22 - Bearing bolt - 18 Nm**23 - 50 Nm + torque a further 90° (1/4 turn)**

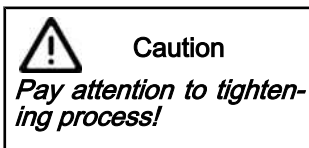
- ☐ replace

24 - Tensioning rail

- ☐ for timing chain

25 - 8 Nm**26 - Top timing case**

- ☐ removing and installing ⇒ [page 33](#)



27 - Timing chain

- ❑ removing and installing ➔ [page 66](#)

28 - Sprocket

- ❑ Lock chain sprocket with counterholder -T10172-

29 - Chain tensioner - 60 Nm

- ❑ for timing chain

30 - Sealing ring

- ❑ replace

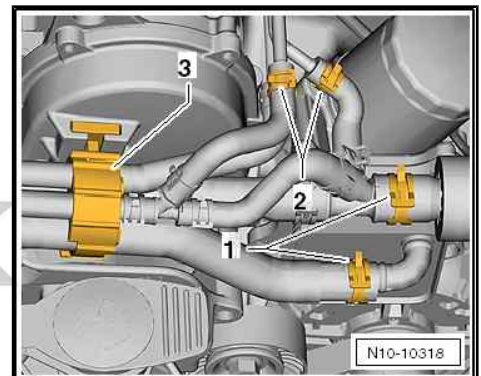
2.2 Removing and installing the top timing case

Special tools and workshop equipment required

- ◆ Hose binding claw
- ◆ Sealant -D 176 501 A1-
- ◆ Screw M6x70 (2x): screws with sawn off head
- ◆ Sealant remover gasket stripper (bearing code GST, part number R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Protective goggles and gloves

Removing

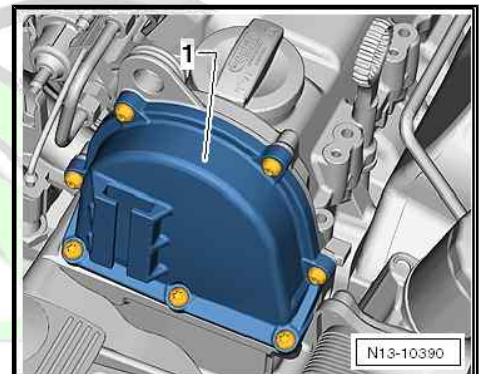
- Drain coolant ➔ [page 99](#) .
- Slacken clamps -1- and -2- and detach coolant hoses.
- Unlatch the clamp -3- and pull it towards the top with the coolant hoses.
- Place the coolant hoses to the rear.



- Unscrew all the fixing screws from the top timing case cover -1-.
- Carefully remove the top timing case cover.

Install

Installation is performed in the reverse order, pay attention to the following points:



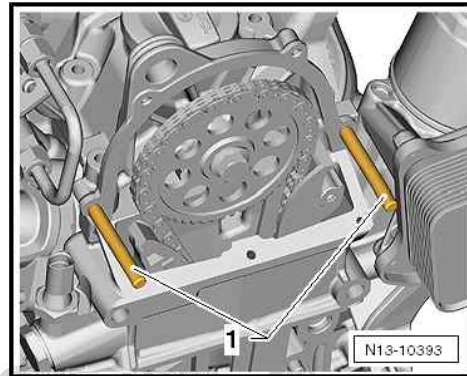


- To better guide the timing case cover, screw two pin screws M6x70 -1- into the cylinder head cover.

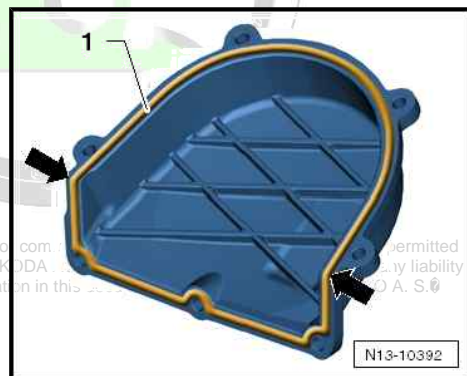
**WARNING**

Wear protective gloves when working with sealant and grease remover!

- Remove residual sealant from the sealing surfaces on the top timing case and at the cylinder head with chemical sealant remover.
- Degrease the sealing surfaces.
- Cut off nozzle tube at the front marking (\varnothing of nozzle approx. 3 mm).

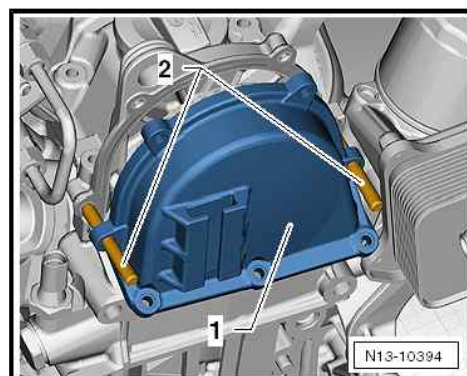
**Note**

- ◆ *The installation procedure must not last longer than 6 minutes from the moment the sealant is applied until the moment the fixing screws are tightened to 8 Nm.*
- ◆ *The sealant begins to harden after 6 minutes.*
- ◆ *Ensure that the tightening process of the fixing screws is carried out in 2 steps.*
- Apply sealant - D 176 501 A1- on the sealing surface -1-.
- Apply a little more sealant in the area of the -arrows-.



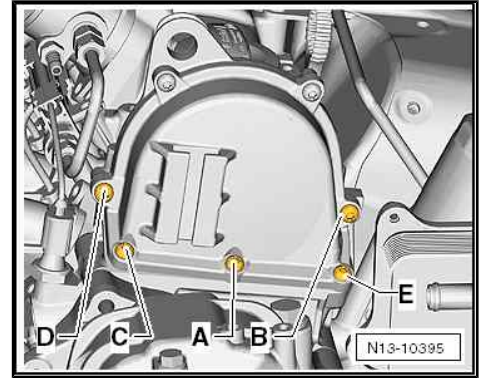
- Position the timing case cover -1- onto the pin screws -2-.
- Push the timing case cover -1- up against the cylinder head cover.
- Make sure that the timing case cover does not tilt.
- Release the stud bolts and screw in the fixing screws by hand.

Stage I of the tightening process.

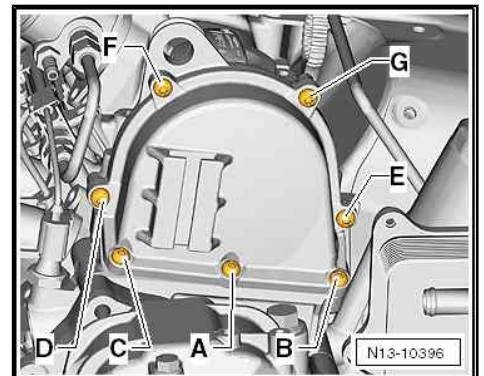


- Tighten the fixing screws to 5 Nm in the specified order -A- to -E-.

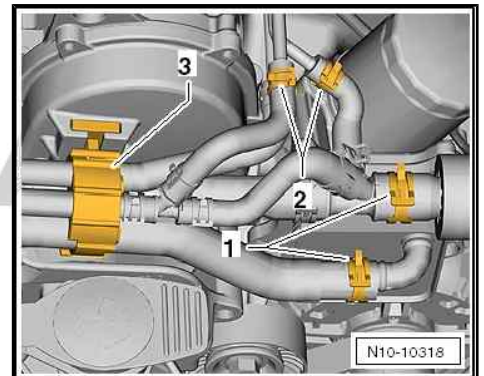
Stage II of the tightening process.



- Tighten the fixing screws to 8 Nm in the specified order -A- to -G-.



- Push the clamp -3- from above fully into the bracket.
- Fit on the coolant hoses and attach the spring strap clamps -1- and -2-.
- Top up coolant ⇒ [page 99](#).



2.3 Removing and installing the bottom timing case

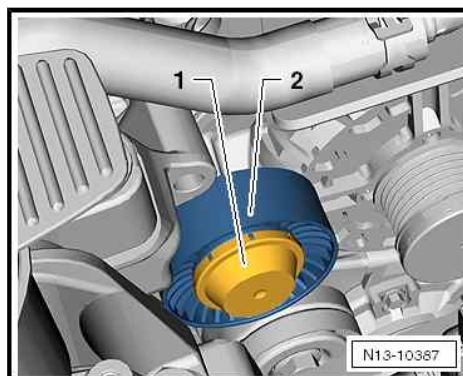
Special tools and workshop equipment required

- ◆ Assembly device -T10417/1-
- ◆ Counterholder -T30004 (3415)-
- ◆ Bolt -T30004/2 (3415/2)-
- ◆ Sealant remover gasket stripper (bearing code GST, part number R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Protective goggles and gloves
- ◆ Sealant - D 176 600 A1

Removing

- Remove noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Remove the front right wheelhouse liner ⇒ Body Work ⇒ Rep. Gr. 66 .

- Remove V-ribbed belt ➔ [page 26](#) .
- If present, remove dust cap -1-.
- Remove guide pulley -2-.
- Remove belt pulley for coolant pump, to do so counterhold the belt pulley with the water pump wrench -V.A.G 1590- .
- Remove belt pulley for crankshaft ➔ [page 41](#) .
- Removing the oil pan ➔ [page 93](#) .



- Unscrew all the fixing screws from the timing case cover -1-.
- Carefully remove timing case.

Install

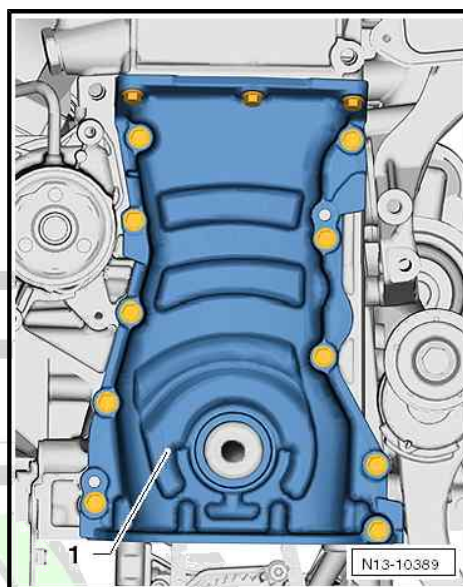
Installation is performed in the reverse order, pay attention to the following points:



WARNING

Wear protective gloves when working with sealant and grease remover!

- Remove residual sealant from the sealing surfaces on the bottom timing case and at the cylinder block with chemical sealant remover.
- Degrease the sealing surfaces.
- Cut off nozzle tube at the front marking (\varnothing of nozzle approx. 3 mm).

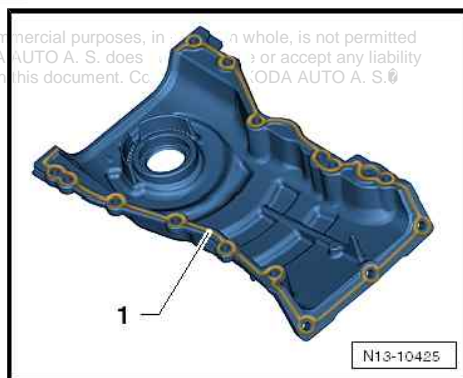


Note

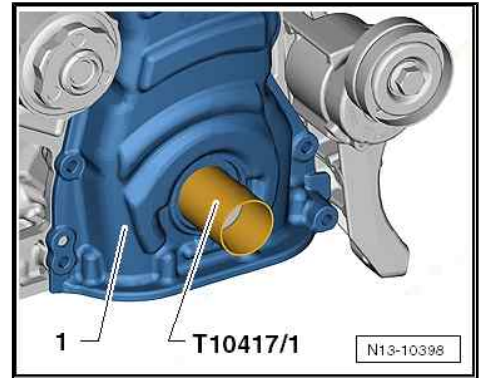
- ♦ *The installation procedure must not last longer than 6 minutes until the moment the fixing screws are tightened to 5 Nm + torqued a further 30°.*
- ♦ *The sealant begins to harden after 6 minutes.*
- ♦ *Insert new fixing screws.*

- Apply sealant -D 176 600 A1- on the sealing surface -1-.

The sealant bead must be 2...3 mm thick and must run past the area of the bolt holes all around the holes.



- Fit the assembly device -T10417/1- on the crankshaft journal.
- Carefully slide the bottom timing case -1- together with the gasket ring over the assembly device.
- Remove the assembly device from the crankshaft journal.



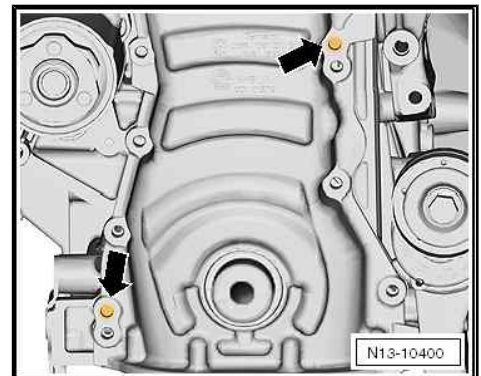
- Slide the bottom timing case onto the dowel pins -arrows- until it rests against the cylinder block.

Make sure that the timing case does not tilt.



Caution

Pay attention to the tightening torque of the fixing screws!
When installing, use new screws.



- First of all tighten the new fixing screws of the timing case evenly by hand.

- Tighten the fixing screws in the specified order -A- to -M-.

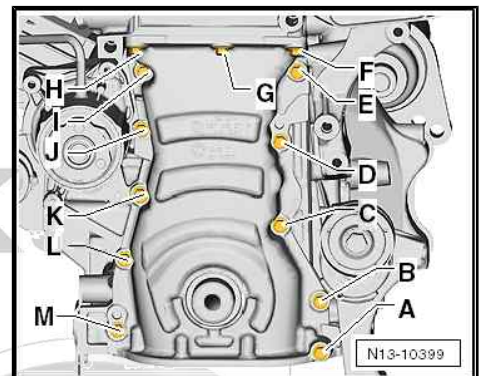
Tightening torque: 5 Nm + torque a further 30°

Install the crankshaft belt pulley ➔ [page 41](#) .

Tightening torques

Belt pulley for coolant pump: 20 Nm

Guide pulley: 40 Nm.





3 Sealing flanges and flywheel

3.1 Summary of components

1 - 150 Nm + torque a further 180° (1½ turn)

- ☐ replace
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder - T30004 (3415)- with bolts - T30004/2 (3415/2)- to prevent it from turning

2 - Belt pulley

- ☐ removing and installing ⇒ [page 41](#)
- ☐ Clamping surfaces must be free of oil and grease.

3 - Diamond coated washer

- ☐ replace

4 - Sealing ring

- ☐ replace

5 - Engine

6 - 60 Nm + torque a further 90° (¼ turn)

- ☐ replace

7 - Flywheel

- ☐ on vehicles with automatic gearbox DSG - two-mass flywheel version
- ☐ removing and installing ⇒ [page 39](#)

8 - Intermediate plate

- ☐ must be positioned on dowel sleeves
- ☐ do not damage/bend during assembly work

9 - 10 Nm

- ☐ replace

10 - Sealing flange on the gearbox side

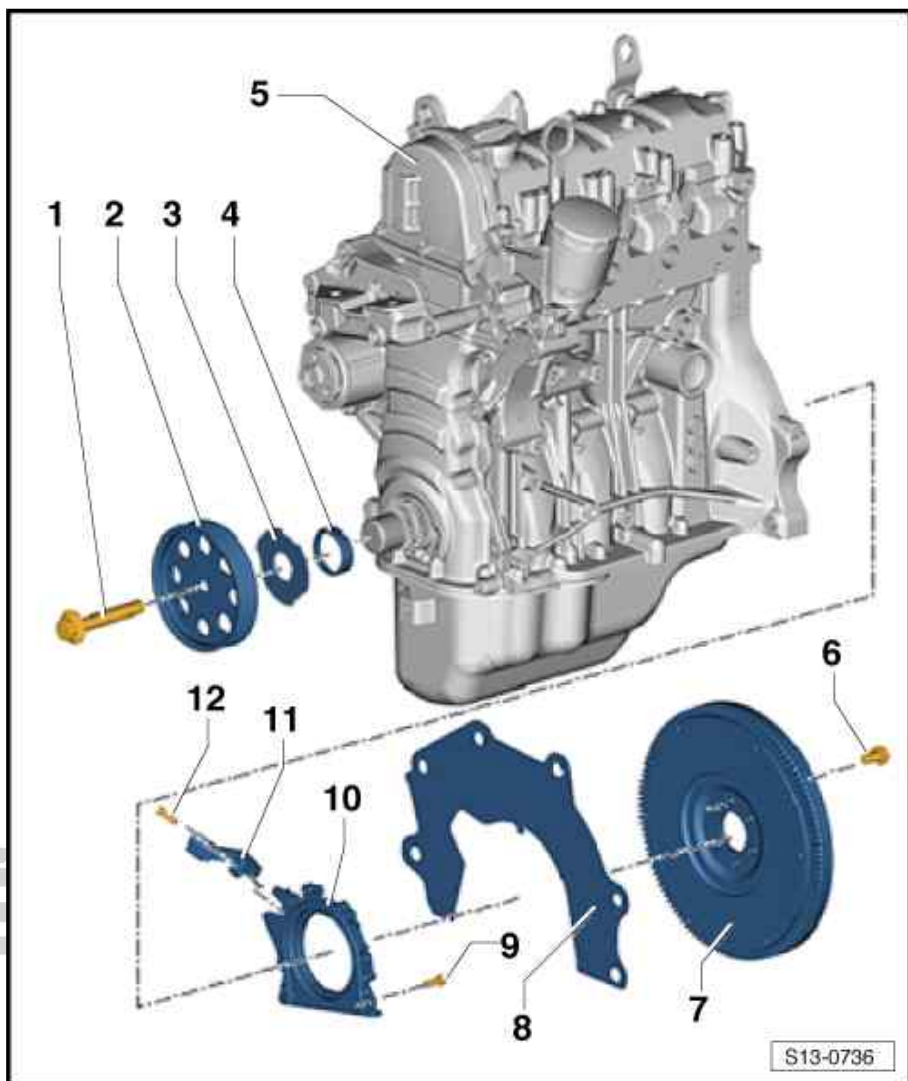
- ☐ Only replace sealing flange complete with gasket ring and rotor
- ☐ replace ⇒ [page 44](#)

11 - Engine speed sender -G28- , 5 Nm

- ☐ with captive screw
- ☐ removing and installing ⇒ [page 184](#)

12 - 5 Nm

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3.2 Removing and installing flywheel

Special tools and workshop equipment required

- ◆ Flywheel lock -MP1-223 (3067)-

or

- ◆ Engine mount -MP 1-202 (VW 540)-
- ◆ Bushing -T30010 (VW 540/1B)-
- ◆ Flywheel lock -MP 1-504-

Removing

- Gearbox is removed.
- Remove clutch on vehicles with manual gearbox ⇒ Gearbox;
Rep. Gr. 30 .

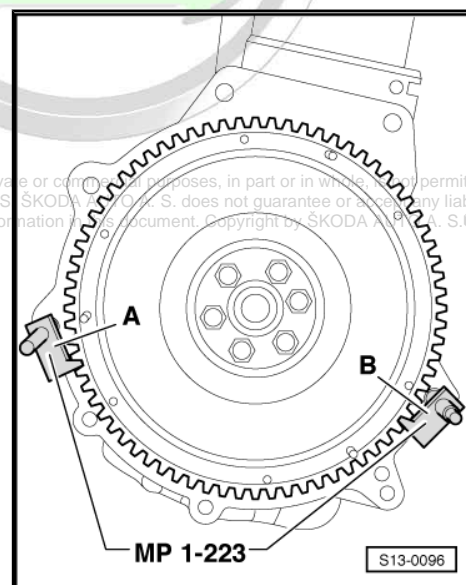
Engine installed

- Insert the counterholder -MP1-223 (3067)- into the bore hole
on the cylinder block.

- Fitting position of the counterholder:

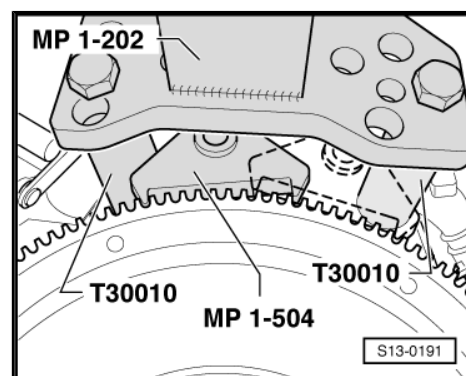
A - for tightening

B - for slackening



Engine removed

- Position the flywheel lock -MP 1-504- on the ring gear of the flywheel and turn crankshaft until the lock rests against the sleeve -T30010 - .



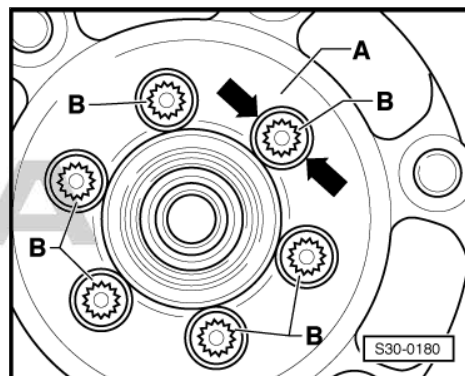
Vehicles with two-mass flywheel

- Rotate the secondary side -A- of the two-mass flywheel in such a way that the screws -B- are positioned in the middle of the holes -arrows-.



Caution

When unscrewing the screws -B-, ensure that the screw head does not jam on the secondary side -A- of the two-mass flywheel, otherwise the flywheel will be damaged.



Continued for all

- Release screws and remove flywheel.

Install

Installation is performed in the reverse order, pay attention to the following points:



Note

Use new screws for attaching.

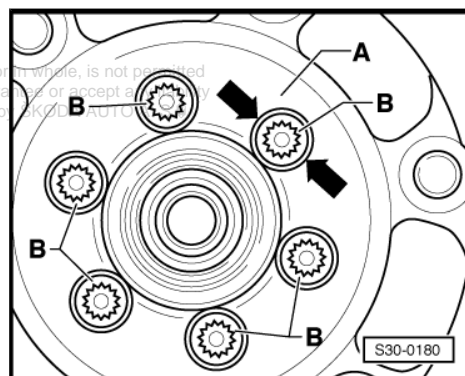
Vehicles with two-mass flywheel

- Rotate the secondary side -A- of the two-mass flywheel in such a way that the screws -B- are positioned in the middle of the holes -arrows-.

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Continued for all

1. Screw in all the screws by hand.
2. Tighten all the screws crosswise to 60 Nm.
3. Torque all the screws crosswise a further 90° (1/4 turn).



3.3 Replacing crankshaft seal on belt pulley side

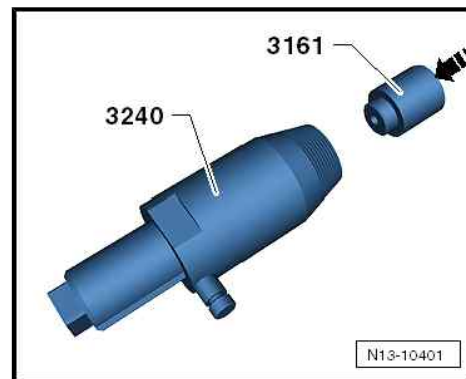
Special tools and workshop equipment required

- ◆ Gasket ring extractor -T30003 (3240)-
- ◆ Assembly device -T10417-
- ◆ Thrust piece -T30015 (3161)-

Removing

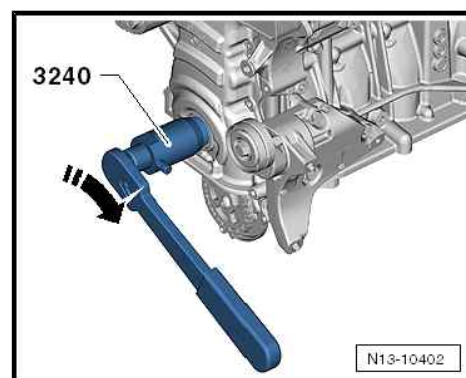
- Remove V-ribbed belt ➔ [page 26](#) .
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1 ➔ [page 58](#) .
- Remove belt pulley for crankshaft ➔ [page 41](#) .

- Push the thrust piece -T30015 (3161)- into the gasket ring extractor -T30003 (3240)- .
- Unscrew the inner part of the gasket ring extractor -T30003 (3240)- up to the beginning of the thread and lock with the knurled screw.

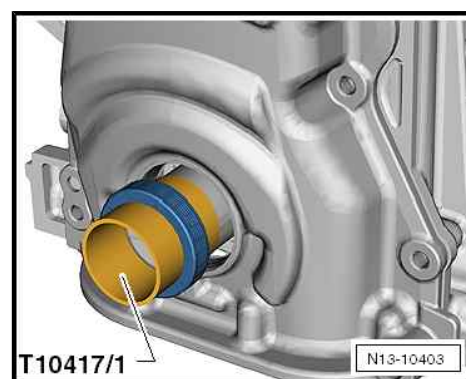


- Oil the thread head of the gasket ring extractor, position and forcibly screw into the gasket ring as far as possible.
- Slacken knurled screw and turn inner side in -direction of arrow- against the crankshaft until the gasket ring is pulled out.

Install



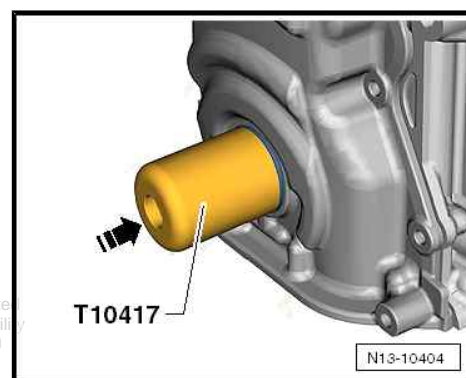
- Position the sleeve -T10417/1- on the crankshaft stub and push the gasket ring over the sleeve.
- Remove the sleeve -T10417/1- from the crankshaft stub.



- Press the gasket ring with the assembly device -T10417- by striking uniformly up to the stop in the timing case.

Install the crankshaft belt pulley ➔ [page 41](#) .

Further installation occurs in reverse order to removal.



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3.4 Removing and installing crankshaft belt pulley

Special tools and workshop equipment required

- ◆ Counterholder -T30004 (3415)-
- ◆ Bolt -T30004/2 (3415/2)-
- ◆ Locating screw -T10340-

**Note**

- ◆ *In order to avoid that the tightening torque of the fixing screw for the crankshaft-belt pulley is inaccurate due to slip, the fixing screw -T10340- must be used in addition to the counterholder -T30004-.*
- ◆ *The crankshaft is only locked in direction of rotation of engine using the fixing screw -T10340-.*

**Caution****Risk of engine damage!**

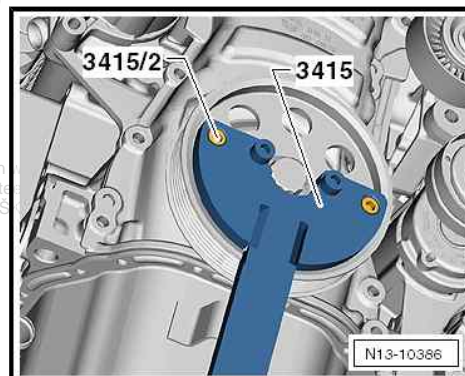
- ◆ *The fixing screw -T10340- must not be used to slacken the fixing screw for the crankshaft-belt pulley - only for tightening!*
- ◆ *The locating screw -T10340- must only be screwed in the "TDC" position of the crankshaft.*

Removing

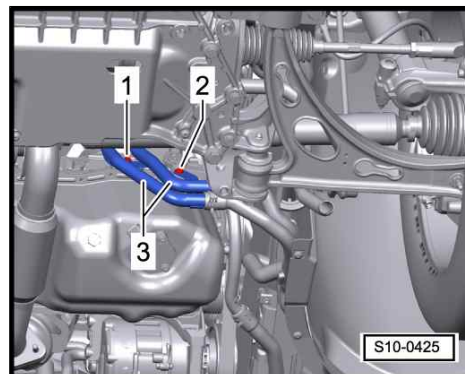
- Remove V-ribbed belt ➔ [page 26](#) .
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1 ➔ [page 58](#) .
- Counterhold belt pulley with counterholder -T30004 (3415)- with bolt -T30004/2 (3415/2)- and release fixing screw for belt pulley.

Install**Vehicles with auxiliary heating.**

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- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

Continued for all vehicles

- Release fixing screws -1- and remove bracket for coolant pipe -2-.

i Note

- ◆ *Make sure that all the clamping surfaces of the fixing screw are free of oil and grease up to the chain sprocket of the crankshaft.*
- ◆ *Always use a new screw of the crankshaft belt pulley.*
- Install the belt pulley and tighten the new fixing screw by hand.
- Release screw plug -arrow- at cylinder block.

i Note

Using the fixing screw should prevent the crankshaft from turning when tightening to the tightening torque.

- Turn the fixing screw -T10340- up to the stop in the cylinder block.

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Caution

If the fixing screw -T10340- cannot be screwed in up to the stop, the crankshaft is not in the correct position!

In this case proceed as described below.

- Unscrew the fixing screw.
- Turn crankshaft 90° (1/4 turn) in direction of rotation of engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Tighten fixing screw -T10340- to 30 Nm.
- Turn crankshaft up to the stop in direction of rotation of engine.

The crankshaft is locked in direction of rotation of engine with the fixing screw -T10340-.

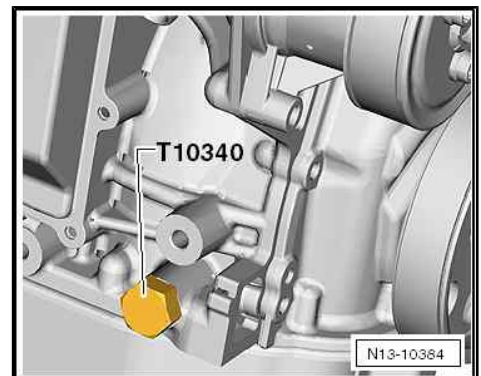
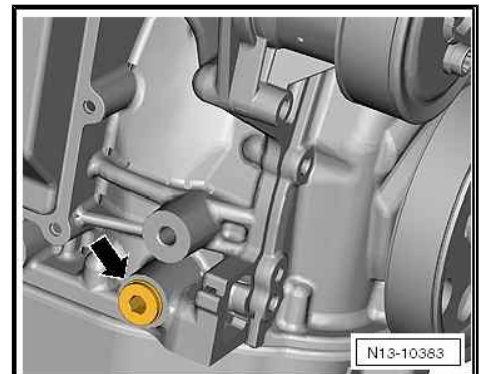
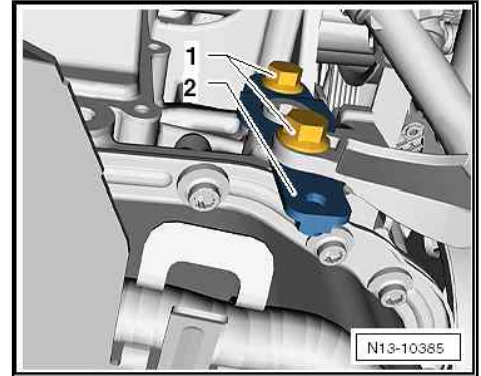


Caution

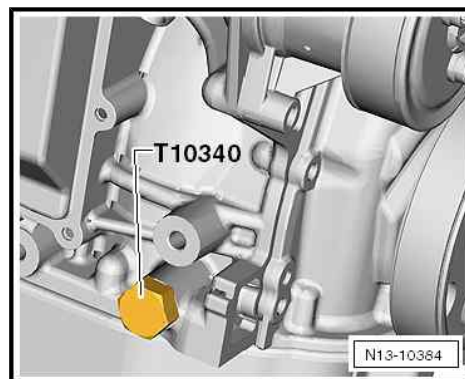
Absolutely use the counterholder -T30004 (3415)- with bolt -T30004/2 (3415/2)- when tightening the fixing screw of the belt pulley in order to avoid damage to the fixing screw.

- Counterhold belt pulley with counterholder -T30004 (3415)- with bolt -T30004/2 (3415/2)- and tighten fixing screw for belt pulley.

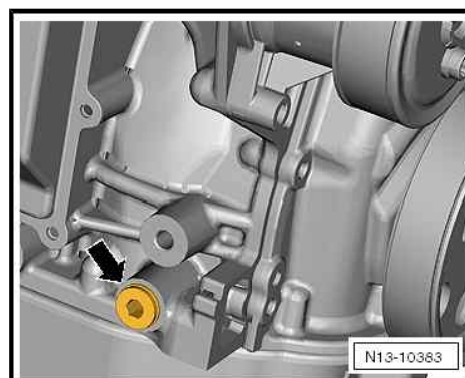
Tightening torque: 150 Nm + torque a further 1/2 turn (180°)



- Release the fixing screw -T10340- from the cylinder block.



- Screw the screw plug again into the cylinder block. Tightening torque: 30 Nm.



- Install bracket for coolant pipe -2- and tighten screws -1-.

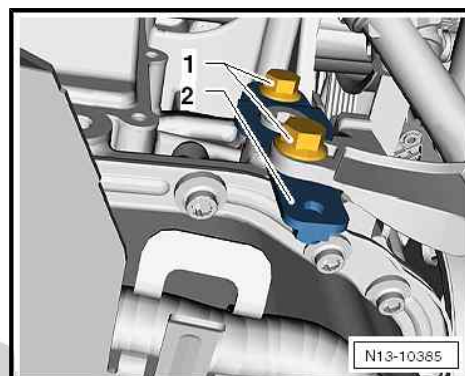
Tightening torque

Screw M6 = 10 Nm

Screw M8 = 20 Nm

- Install the V-ribbed belt ➔ [page 26](#) .

Further installation occurs in reverse order to removal.



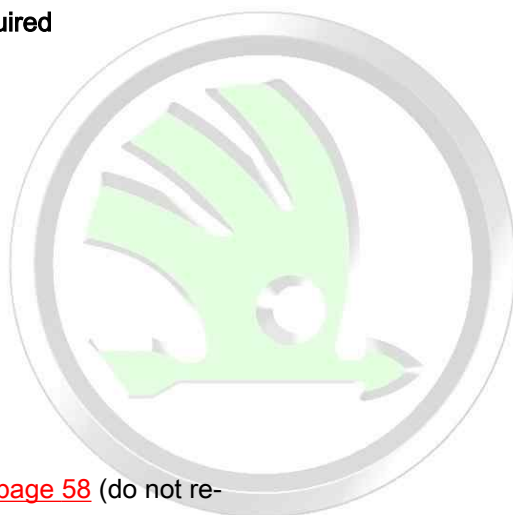
3.5 Replace sealing flange on the gearbox side

Special tools and workshop equipment required

- ◆ Assembly device -T10134-
- ◆ Feeler gauges
- ◆ Steel straightedge
- ◆ Screw M6x35 (3x)
- ◆ Screw M7x35 (2x)

3.5.1 Removing

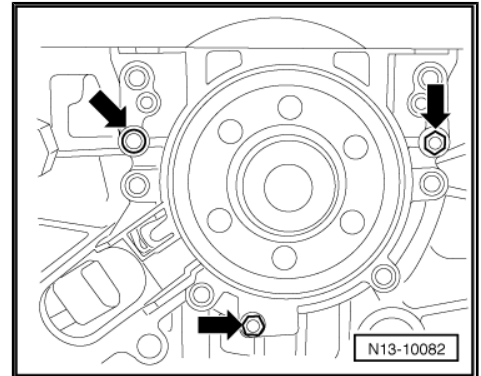
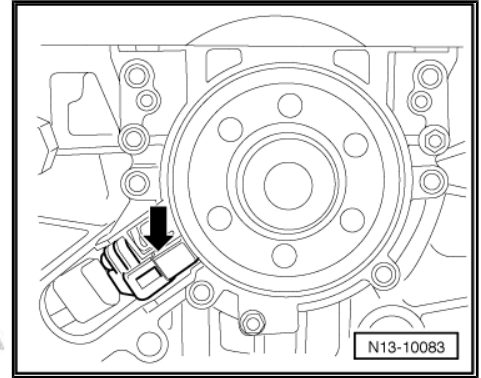
- Gearbox is removed.
- Remove the flywheel.
- Remove intermediate plate.
- Position engine on TDC of cylinder 1 ➔ [page 58](#) (do not remove the caps for the camshafts).
- Removing the oil pan ➔ [page 93](#) .



- Remove engine speed sender -G28- -arrow-.
- Unscrew the fixing screws of the sealing flange.

i Note

Sealing flange and rotor are pressed together with 3 M6x35 mm screws from the crankshaft.



- Screw three screws M6x35 into the threaded bores of the sealing flange -arrows-.
- Screw the screws alternately (max. 1/2 turn (180°) per screw) in the sealing flange and press the sealing flange together with the rotor from the crankshaft.

3.5.2 Install

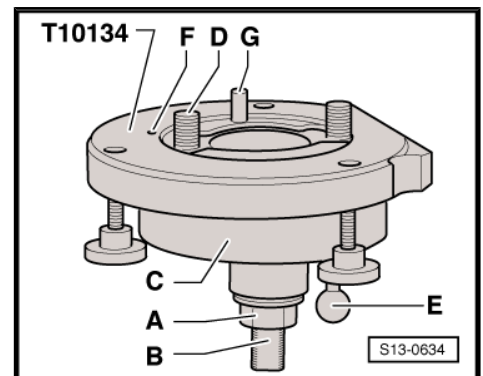
i Note

- ♦ *The sealing flange with PTFE gasket ring is provided with sealing lip supporting ring. This supporting ring is intended as an assembly sleeve and must not be removed before installing.*
- ♦ *Do not separate or turn the sealing flange and rotor after removing them from the spare part package.*
- ♦ *The rotor is given its fitting location by fixing the assembly device -T10134- to the positioning pin.*
- ♦ *The sealing flange and gasket ring form one unit and must be replaced together with the rotor.*
- ♦ *The assembly device -T10134- is given its fitting location to the crankshaft by means of a guide bolt, which is guided into a hole of the crankshaft.*

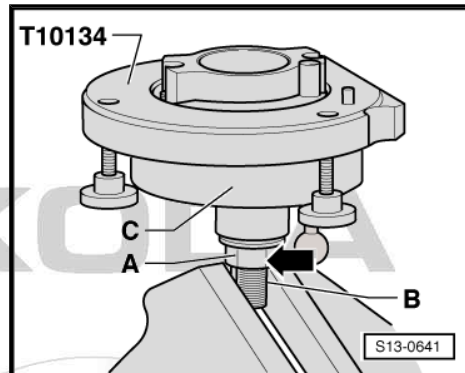
Assembly device -T10134-

- A - Hexagon nut
- B - Clamping surface
- C - Assembly cup
- D - Allan screw
- E - Guide bolts (with red handle - for fuel engine)
- F - Positioning pin
- G - Guide bolts (with black handle - for diesel engine)

A - Mounting sealing flange with rotor on the assembly device - T10134-



- Screw the hexagon nut -A- right up to the clamping surface -B- and grip the assembly device -T10134- on the clamping surface -B- of the threaded spindle in a vice.

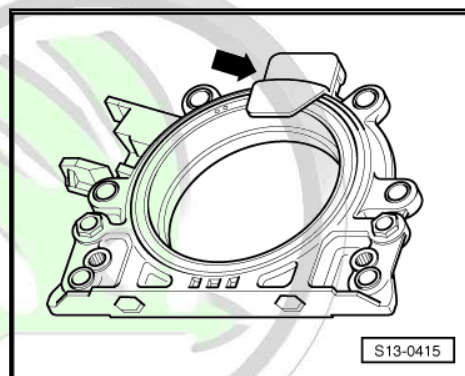


- Remove the securing clip -arrow- from the new sealing flange.



Note

Do not remove or turn the rotor from the sealing flange.



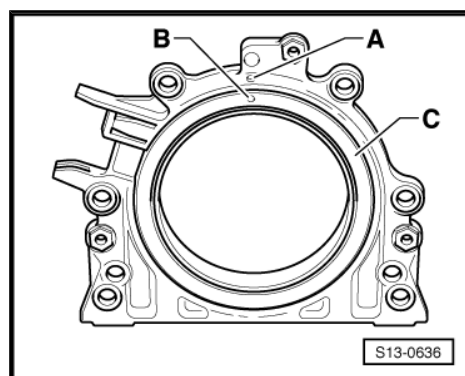
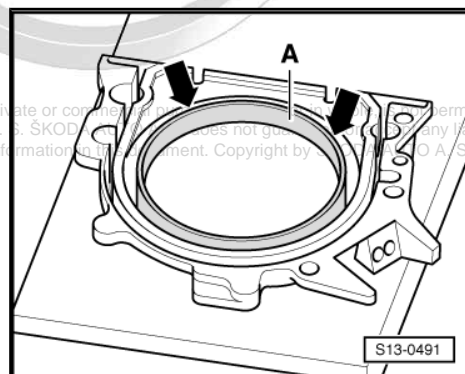
- Lay the front side of the sealing flange on a clean and level surface.
- Press down sealing lips supporting ring -A- in -direction of the arrow-, until it rests on the level surface.



Note

The top side of the rotor and the front side of the sealing flange must be flush.

- The locating hole -B- on the rotor -C- must be flush with the marking -A- on the sealing flange.

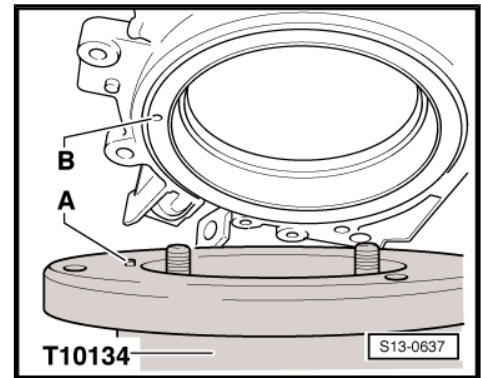


- Lay the sealing flange with the front side on the assembly device -T10134- in such a way that the positioning pin -A- engages into the hole -B- of the rotor.



Note

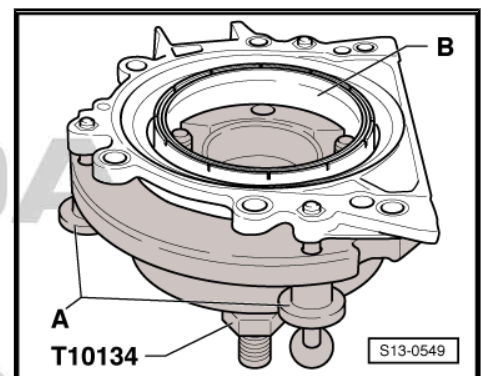
Make sure the sealing flange lies flat on the assembly device.



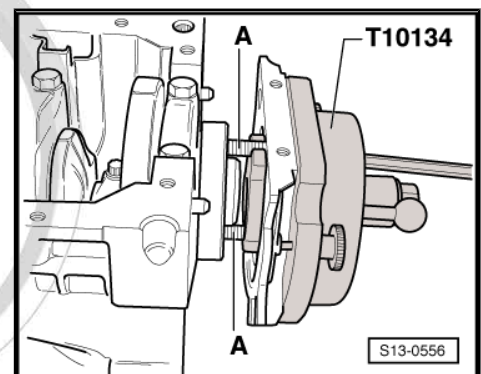
- When tightening the knurled screws -A- press the sealing lip supporting ring -B- on the surface of the assembly device in such a way that the positioning pin cannot slide out of the rotor hole.

B - Mount the assembly device -T10134- on the crankshaft flange

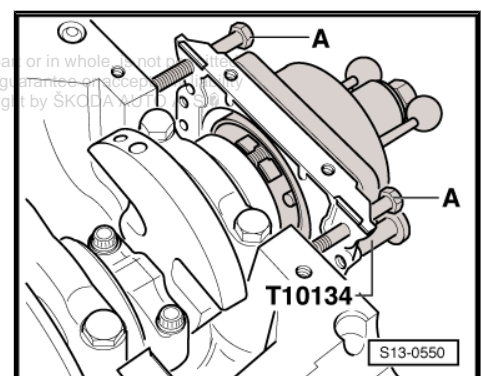
- The crankshaft flange must be free of grease and oil
- Crankshaft is at TDC for cylinder 1
- Unscrew hexagon nut up to the end of the threaded spindle.



- Screw assembly device -T10134- with Allan screws -A- up to the stop onto the crankshaft flange.



- Screw in two M6x35 mm screws -A- by about 3 turns for sealing flange guide into the cylinder block.



- Move the assembly cup -C- by hand in the -direction of the arrow- until the rotor -B- rests on the crankshaft flange -A-. Subsequently insert the guide bolt with red ball -F- fully into the threaded bore of the crankshaft. If the guide bolt is correctly pushed in, then the handle has a distance of approx. 10 mm from the assembly cup -C-. This gives the rotor its final fitting location.

C - Pressing the rotor onto the crankshaft flange

- Screw in hexagon nut by hand onto the threaded spindle until it rests against the assembly cup.

- Tighten the hexagon nut of the assembly device using a torque wrench with adapter.

Tightening torque: 35 Nm.



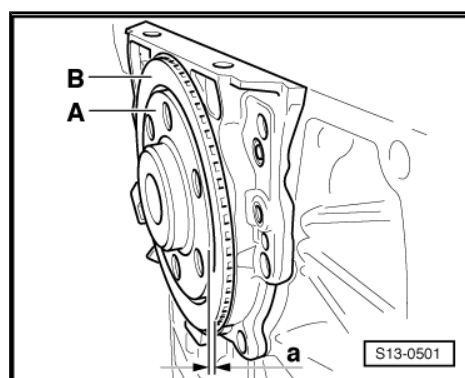
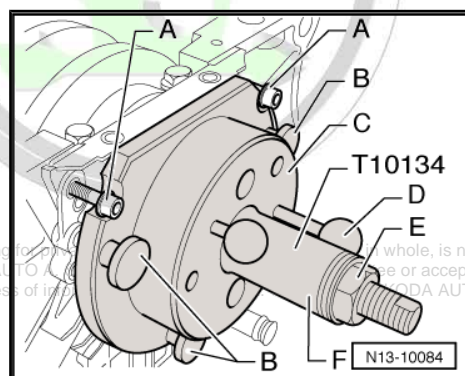
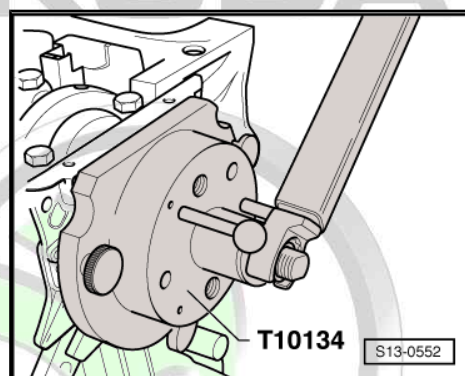
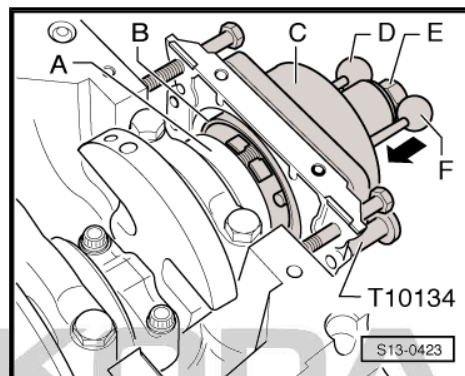
Note

After tightening the hexagon nut to 35 mm there must still be a narrow air gap between the cylinder block and the sealing flange.

D - Inspecting the fitting position of the rotor on the crankshaft

- Unscrew hexagon nut -E- up to the end of the threaded spindle.
- Unscrew two M6x35 mm screws -A- from the cylinder block.
- Release three knurled screws -B- from the sealing flange.
- Unscrew two Allan screws and remove assembly device - T10134- .
- Remove sealing lips supporting ring.

The fitting position of the rotor on the crankshaft is accurate if there is a distance -a- = 0.5 mm between the crankshaft flange -A- and the rotor -B-.



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- Position the steel straightedge onto the crankshaft flange.
- Measure the distance between the steel straightedge and the rotor with a feeler gauge.

If the measured distance is less than 0.5 mm:

- Press down rotor ➔ [page 49](#) .

If the dimension is correct:

- Tighten the new fixing screws of the sealing alternately cross-wise.

Tightening torque: 10 Nm.

- Install engine speed sender -arrow-.

Tightening torque: 5 Nm.

- Installing the oil pan ➔ [page 93](#) .
- Installing intermediate plate.
- Install flywheel with new screws.

E - Pressing down the rotor

- Screw assembly device -T10134- with Allan screws up to the stop onto the crankshaft flange.
- Screw in three knurled screws -A- into the flange.
- Subsequently insert the guide bolt with red ball -E- fully into the threaded bore of the crankshaft. If the guide bolt is correctly slipped on, then the handle has a distance of approx. 10 mm from the assembly cup -B-.

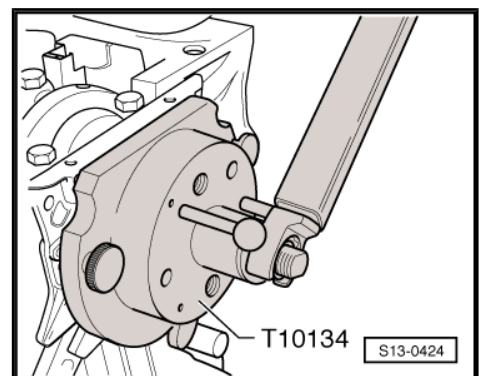
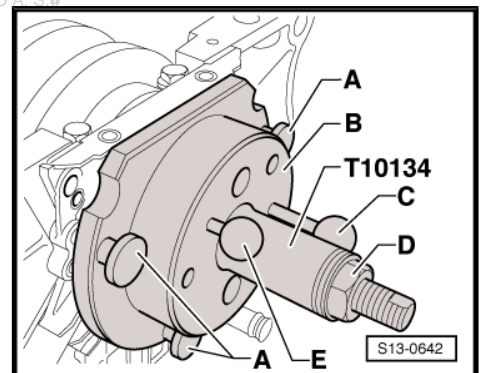
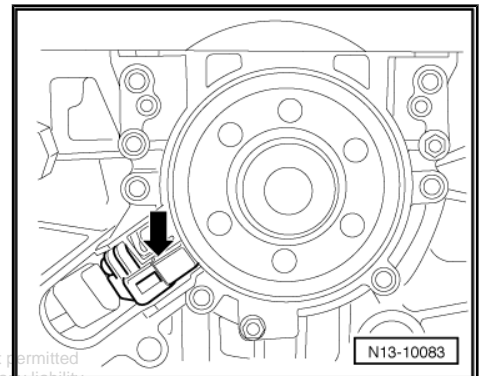
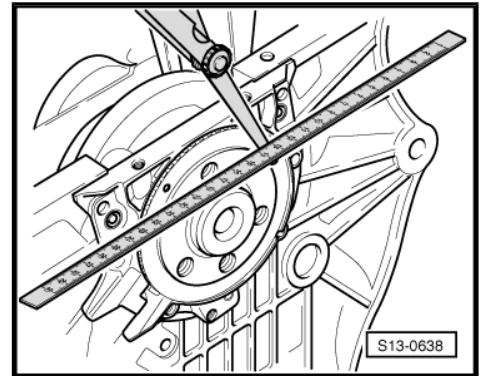
- Tighten the hexagon nut of the assembly device using a torque wrench with adapter.

Tightening torque: 40 Nm.

- Again inspect the fitting position of the rotor on the crankshaft ➔ [page 48](#) .

If the dimension -a- is again too small:

- Tighten the hexagon nut of the assembly device to 45 Nm.
- Again inspect the fitting position of the rotor on the crankshaft ➔ [page 48](#) .



4 Crankshaft



Caution

The crankshaft must not be removed. Merely releasing the screws of the crankshaft bearing cover will result in deformations of the bearing seats of the cylinder block. These deformations will reduce the bearing clearance. If the bearing shells are not replaced, the changed bearing clearance may cause damage to the bearing.

If the bearing cover screws have been released, replace the complete cylinder block together with the crankshaft.

It is not possible to measure the crankshaft bearing clearance with workshop tools.

4.1 Replace needle bearing for crankshaft

Only on vehicles fitted with automatic gearbox.

Special tools and workshop equipment required

- ◆ Centering mandrel -T30029 (3176)-
- ◆ Interior extractor -Kukko 21/2-
- ◆ Countersupport - Kukko 22/1-

Removing

- Pull out needle bearing with interior extractor -Kukko 21/2- and countersupport -Kukko 22/1- .

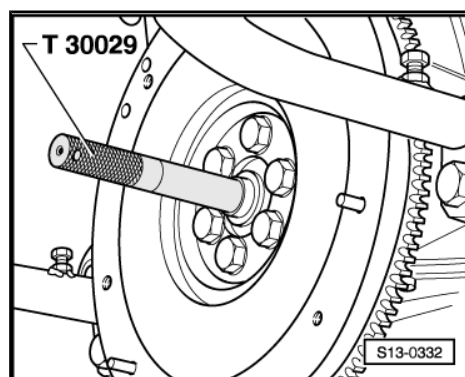
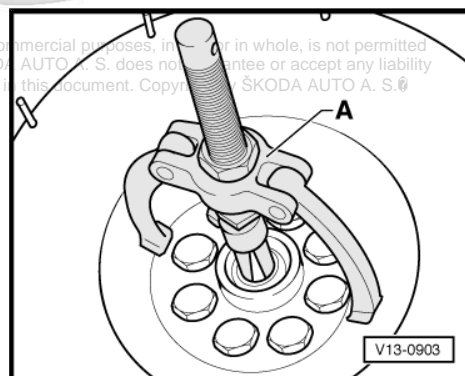
Install



Note

The marked side of the needle bearing should be legible when in its installed condition.

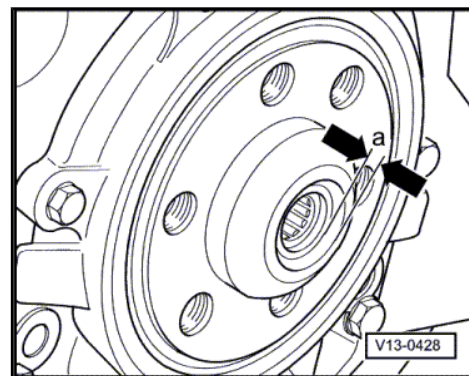
- Drive in the needle bearing using the centering pin -T30029- .
- Fitting position: The marked side of the needle bearing should be legible when in its installed condition.





Depth of installation of the needle bearing:

- Dimension -a- = 1.5 up to 2 mm



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5 Pistons and conrods

5.1 Summary of components



Note

Before assembly oil all bearing and contact surfaces.

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1 - Circlip

2 - Piston pin

- ☐ if stiff, heat piston to 60° C
- ☐ use drift -T10046- for removing and installing

3 - Piston

- ☐ check ➔ [page 54](#)
- ☐ mark installation position and matching cylinder
- ☐ arrow on piston crown faces towards the belt pulley side
- ☐ use piston ring tensioning strap for installing
- ☐ Piston Ø: 70,95 mm (nominal dimension)
- ☐ Cylinder Ø: 71,00 mm (nominal dimension)

4 - Gasket rings

- ☐ Offset joint 120°
- ☐ use piston ring pliers for removing and installing compression rings
- ☐ Marking "TOP" faces piston crown
- ☐ Inspect gap clearance ➔ [page 53](#)
- ☐ Inspect end clearance ➔ [page 53](#)

5 - Oil scraper rings

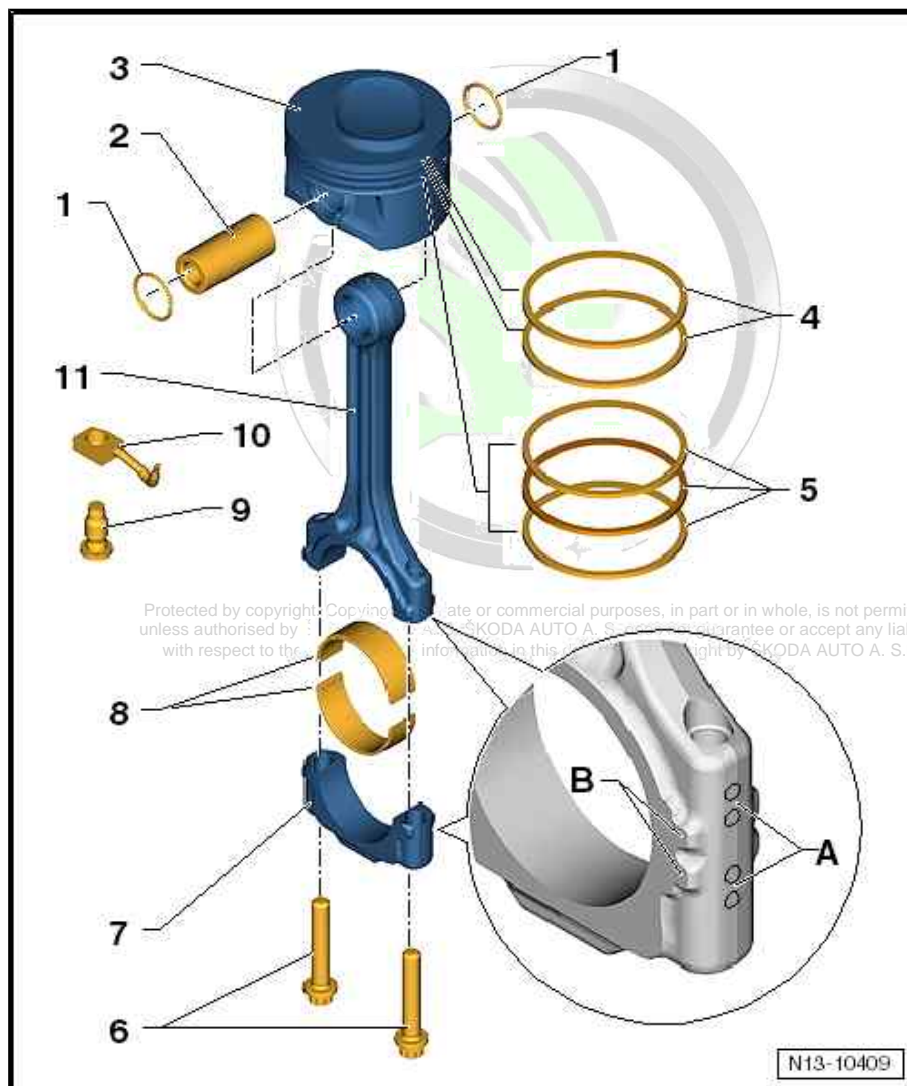
- ☐ carefully remove and install 3-part oil scraper rings by hand
- ☐ Inspect gap clearance ➔ [page 53](#)
- ☐ End clearance cannot be measured

6 - 30 Nm + torque a further 90° (1/4 turn)

- ☐ replace
- ☐ Oil thread and contact surface

7 - Conrod bearing cap

- ☐ as a result of the conrods separated in the cracking process, the cover fits only in one position and only to the relevant conrod
- ☐ Mark the assignment of the cylinder before removal -A-





- ☐ Fitting position: Marking -B- points to the belt pulley side (mark before removing if marking is missing)

8 - Bearing shell

- ☐ do not mix up used bearing shells
- ☐ insert bearing shells in the centre

9 - Pressure relief valve, 27 Nm

- ☐ Opening pressure: 0,2 MPa (2,0 bar)

10 - Oil injection nozzle

- ☐ for cooling pistons
- ☐ Align the guide edge of the oil injection nozzle -arrow- to the area of the cylinder block being worked on.

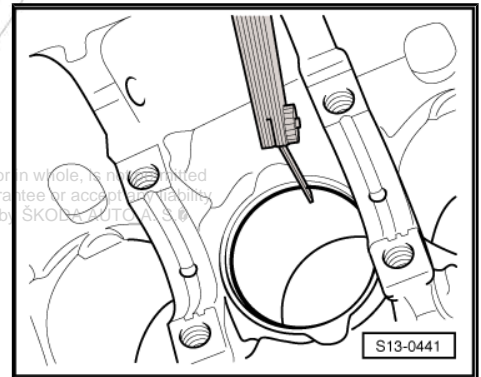
11 - Conrod

- ☐ always replace as a set only
- ☐ mark matching cylinder -A-
- ☐ Fitting position: Marking -B- points to the belt pulley side (mark before removing if marking is missing)
- ☐ located axially by pistons
- ☐ separate new conrod ➔ [page 55](#)

5.2 Inspect piston, piston rings and cylinder bore

Inspecting piston ring gap clearance

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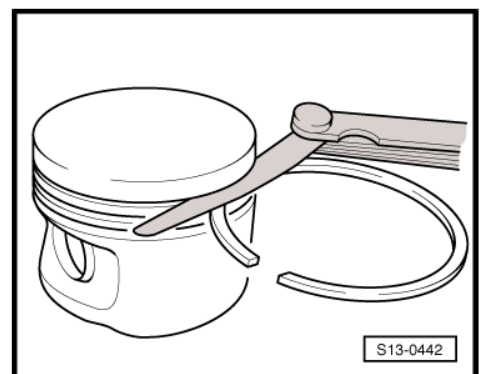


Special tools and workshop equipment required

- ◆ Feeler gauge
- Insert ring at right angles from above down into lower cylinder bore, about 15 mm away from edge of cylinder.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,20...0,40	1,0
2. Compression ring	0,40...0,60	1,0
Oil scraper ring	0,25...0,75	no wear indication possible

Inspect piston ring end clearance



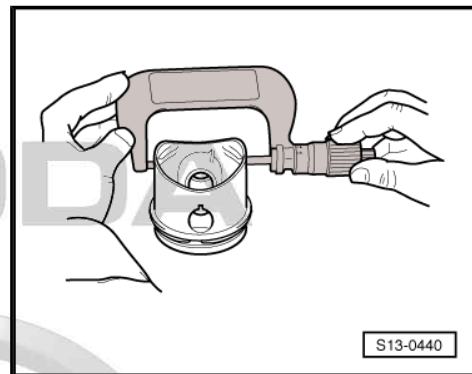
Special tools and workshop equipment required



- ◆ Feeler gauge
- Clean ring groove before inspecting.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,03...0,09	0,15
2. Compression ring	0,02...0,06	0,15
Oil scraper ring	cannot be measured	

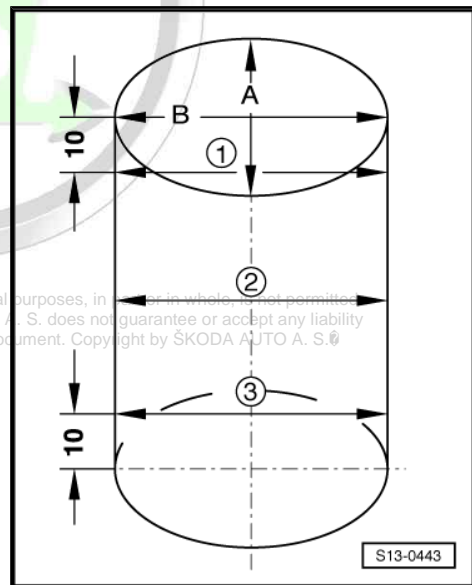
Inspecting pistons



Special tools and workshop equipment required

- ◆ External micrometer 75...100 mm
- Measure about 7 mm from the lower edge and offset 90° to piston pin axis.
- Deviations from specified dimension: max. 0.04 mm

Inspecting cylinder bore



Special tools and workshop equipment required

- ◆ Internal precision measuring instrument 50...100 mm
- Measure at 3 points crosswise in a transverse direction -A- and lengthwise -B-.
- Deviations from specified dimension: max. 0.08 mm



Note

Do not measure the cylinder bore if the cylinder block is fixed to the assembly stand -MP 1-202- with the engine mount -MP 9-101 -, as this may result in incorrect measurements.

5.3 Separating new conrod

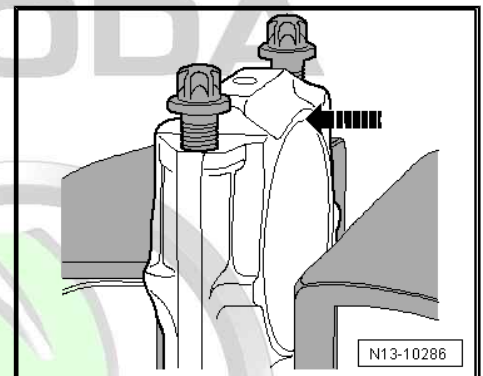
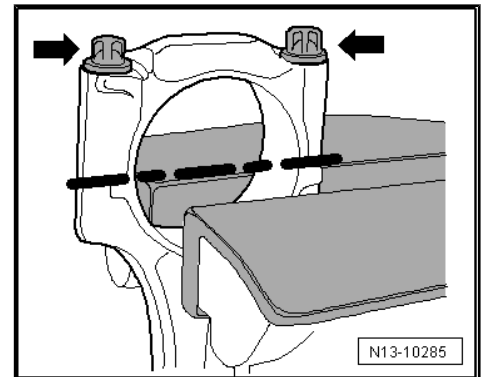
It can happen that the predetermined breaking point on the new conrod is not completely pierced. If the conrod bearing cap cannot be removed by hand, then proceed as follows:

- Mark the assignment of the cylinder to the conrod.
- Slightly clamp the conrod in a vice provided with aluminium protective jaws, as shown in the illustration.



Note

- ◆ *Only tension the conrod slightly in order to avoid damage.*
- ◆ *The conrod is clamped below the broken line.*
- Release both screws -arrows- by approx. 5 turns.
- Carefully knock against the conrod bearing cap with a rubber hammer in -direction of arrow- in order to loosen it.



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15 – Cylinder Head, Valve Gear

1 Cylinder head - part 1

1.1 Summary of components

Testing compression pressure ⇒ [page 83](#) .



Note

- ◆ *When installing a replacement cylinder head, all the contact surfaces between the hydraulic tappets, the cam followers and the cam tracks must be oiled before installing the cylinder head cover.*
- ◆ *Do not remove the plastic bases supplied as a protection for the open valves until just before fitting on the cylinder head.*
- ◆ *If the cylinder head is replaced, also the entire coolant must be replaced.*
- ◆ *Before assembly moisten all bearing and contact surfaces with oil.*
- ◆ *Removing and installing intake manifold ⇒ [page 159](#) .*



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1 - 8 Nm

2 - High pressure pump

- ☐ for fuel supply
- ☐ with fuel pressure regulating valve -N276-
- ☐ removing and installing
⇒ [page 163](#)

3 - 10 Nm

4 - Hall sender -G40-

- ☐ with O-ring
- ☐ replace the O-ring if it is damaged

5 - 20 Nm

6 - Lifting eye

7 - 8 Nm + torque a further 90°
(1/4 turn)

- ☐ replace
- ☐ order of tightening
⇒ [page 73](#)

8 - Cylinder head cover

- ☐ removing and installing
⇒ [page 73](#)

9 - 10 Nm

10 - Coolant temperature sender -G62-

- ☐ before removing, reduce pressure in cooling system

11 - O-ring

- ☐ replace

12 - Cylinder head gasket

- ☐ replace
- ☐ metal gasket
- ☐ after replacing fill entire system with fresh coolant

13 - Cylinder head

- ☐ removing and installing ⇒ [page 80](#)
- ☐ check for distortion ⇒ [page 58](#)
- ☐ Sealing surfaces must be free of oil and grease
- ☐ after replacing fill entire system with fresh coolant

14 - Supporting element

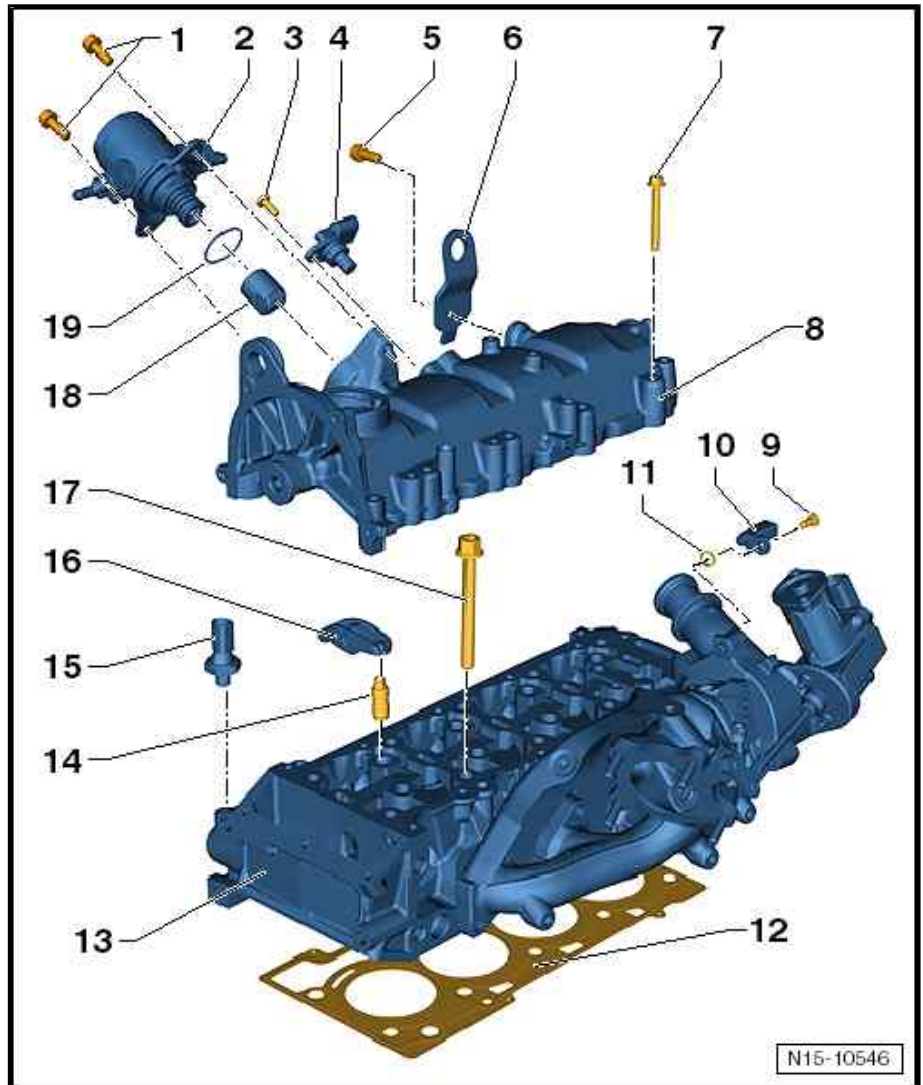
- ☐ do not interchange
- ☐ with hydraulic valve clearance compensation
- ☐ oil contact surfaces

15 - Oil pressure switch -F1- , 20 Nm

- ☐ check ⇒ [page 96](#)
- ☐ Cut open gasket ring if leaking and replace

16 - Roller rocker arm

- ☐ inspect roller bearings for smooth operation
- ☐ oil contact surfaces



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- ☐ to install clip onto the supporting element with the locking clips

17 - Cylinder head bolt

- ☐ replace
- ☐ observe the mounting instructions and sequence for loosening and tightening ⇒ [page 80](#)

18 - Roller tappet

- ☐ Lightly moisten the contact surface with engine oil

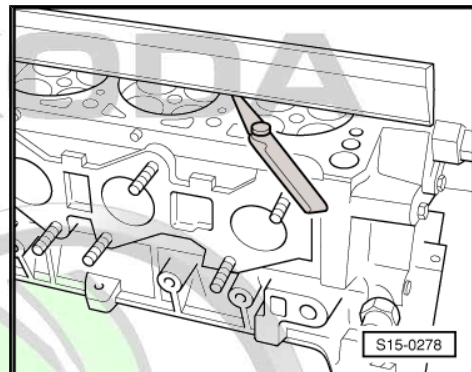
19 - O-ring

- ☐ replace
- ☐ moisten with oil before inserting

Inspecting the cylinder head for distortion

Check with straightedge 500 mm , e. g. -VAS 6075- and feeler gauge.

- Max. permissible distortion: 0.05 mm



1.2 Test timing

Special tools and workshop equipment required

- ◆ Locking bolt -T10414-
- ◆ Locating screw -T10340-

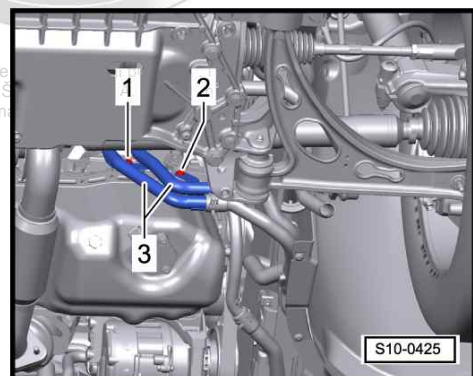
Test sequence

Vehicles with auxiliary heating.

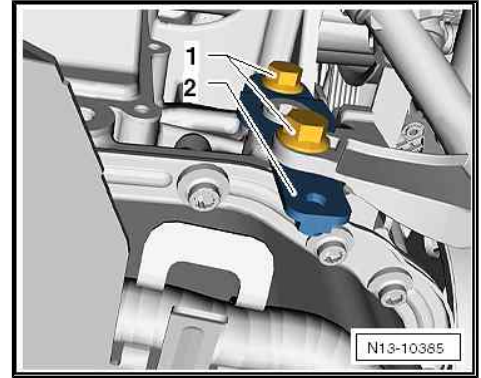
- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

Continued for all vehicles

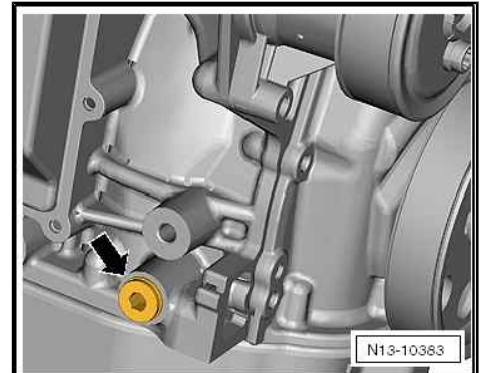
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- Release fixing screws -1- and remove bracket for coolant pipe -2-.



- Release screw plug -arrow- at cylinder block.



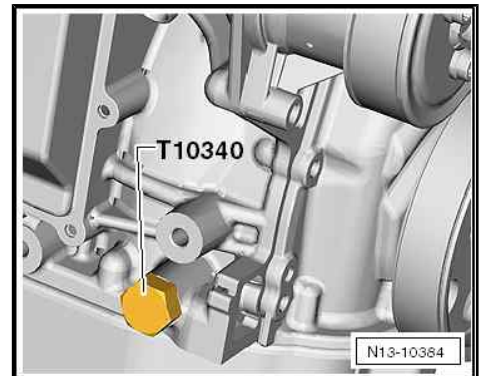
- Turn the fixing screw -T10340- up to the stop in the cylinder block.



Caution

If the fixing screw -T10340- cannot be screwed in up to the stop, the crankshaft is not in the correct position!

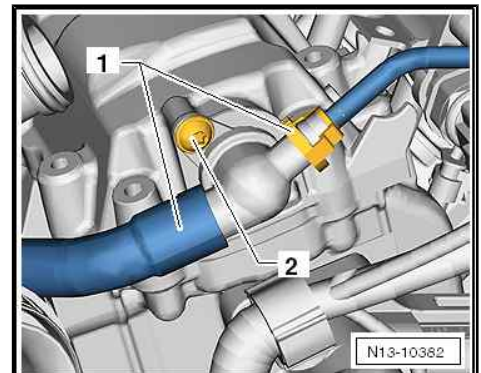
In this case proceed as described below.



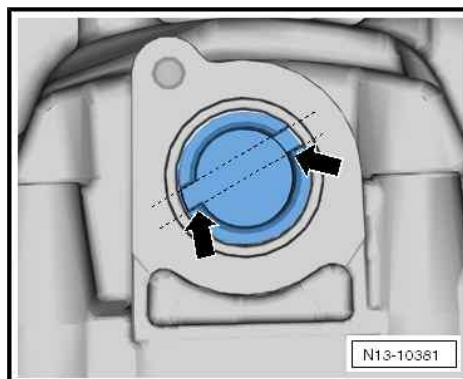
- Unscrew the fixing screw.
- Turn crankshaft 90° (1/4 turn) in direction of rotation of engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Tighten fixing screw -T10340- to 30 Nm.
- Turn crankshaft up to the stop in direction of rotation of engine.

The crankshaft is locked in direction of rotation of engine with the fixing screw -T10340-.

- Pull off both coolant hoses -1- from the non-return valve.
- Release the fixing screw -2- and pull the non-return valve out of the cylinder head cover.



The grooves in the camshaft -arrows- must be in the position shown.



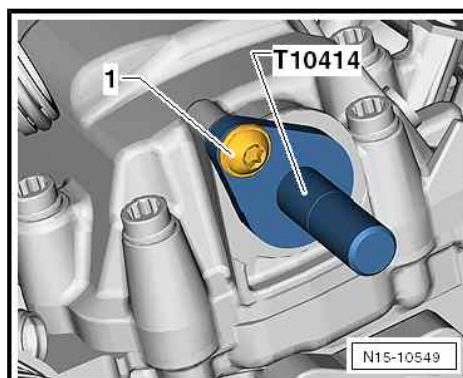
- Insert the locking bolt -T10414- up to the stop into the cylinder head cover.

If the locking bolt -T10414- cannot be inserted up to the stop into the camshaft opening, the timing is not correct and must be set ➔ [page 60](#) .

The timing is O.K., if the locking bolt -T10414- can be pushed up to the stop into the cylinder head cover.

- Remove locking bolt -T10414- and fixing screw -T10340- .

Further installation occurs in reverse order to removal.



1.3 Setting the timing

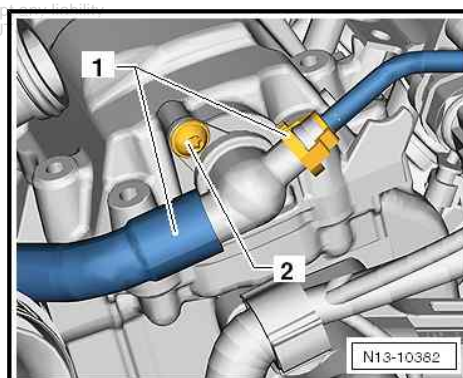
Special tools and workshop equipment required

- ◆ Locking bolt -T10414-
- ◆ Locating screw -T10340-
- ◆ Counterholder -T10172 -

Work procedure

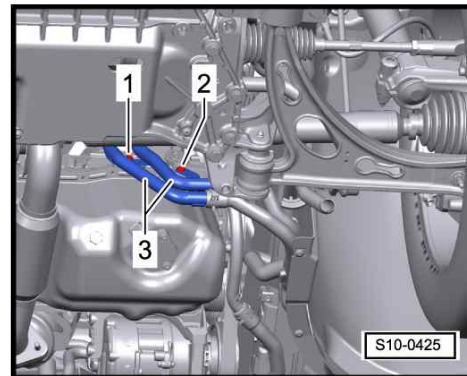
- Drain coolant ➔ [page 99](#) .
- Remove top timing case ➔ [page 33](#) .
- Pull off both coolant hoses -1- from the non-return valve.
- Release the fixing screw -2- and pull the non-return valve out of the cylinder head cover.

Vehicles with auxiliary heating.

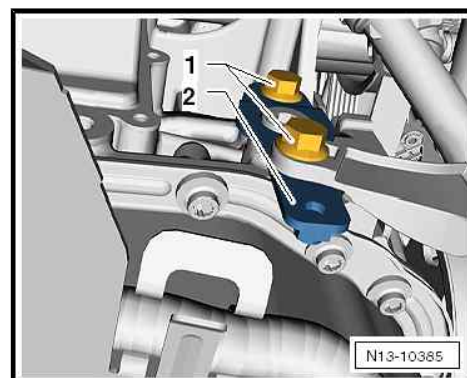


- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

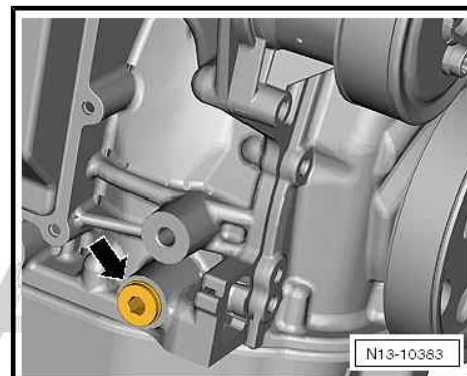
Continued for all vehicles



- Release fixing screws -1- and remove bracket for coolant pipe -2-.



- Release screw plug -arrow- at cylinder block.



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- Turn the fixing screw -T10340- up to the stop in the cylinder block.



Caution

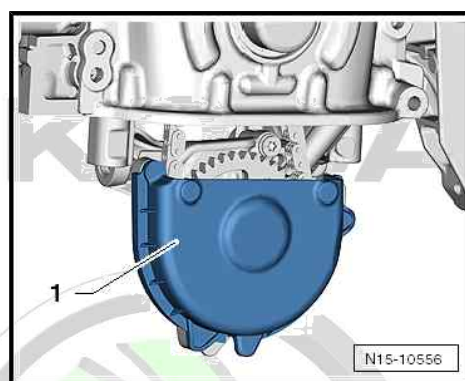
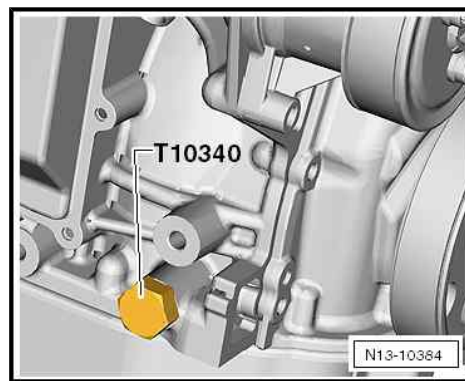
If the fixing screw -T10340- cannot be screwed in up to the stop, the crankshaft is not in the correct position!

In this case proceed as described below.

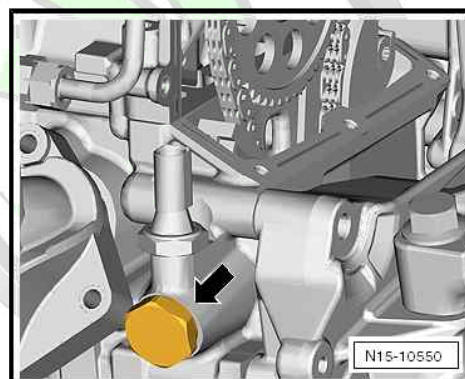
- Unscrew the fixing screw.
- Turn crankshaft 90° ($\frac{1}{4}$ turn) in direction of rotation of engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Tighten fixing screw -T10340- to 30 Nm.
- Turn crankshaft up to the stop in direction of rotation of engine.

The crankshaft is locked in direction of rotation of engine with the fixing screw -T10340- .

- Removing the oil pan ➔ [page 93](#) .
- Pull off the cover -1- from the oil pump.

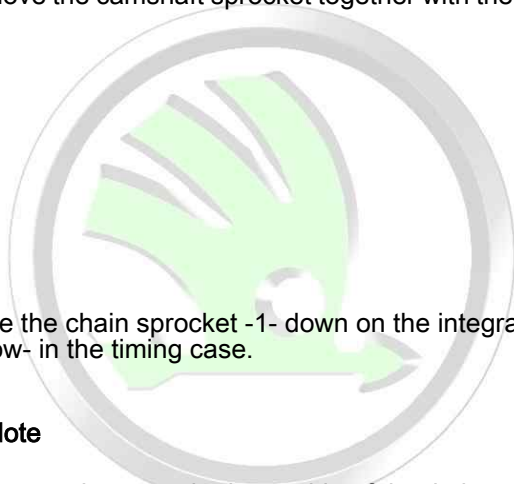


- Release chain tensioner -arrow- for timing chain.



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- Hold the camshaft sprocket with the counterholder -T10172- and slacken the fixing screw -1- of the camshaft sprocket.
- Remove the camshaft sprocket together with the fixing screw.



- Place the chain sprocket -1- down on the integrated peg -arrow- in the timing case.



Note

The integrated peg on the inner side of the timing case prevents the chain sprocket from falling down.

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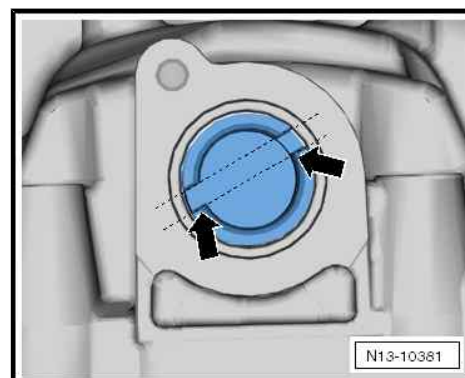
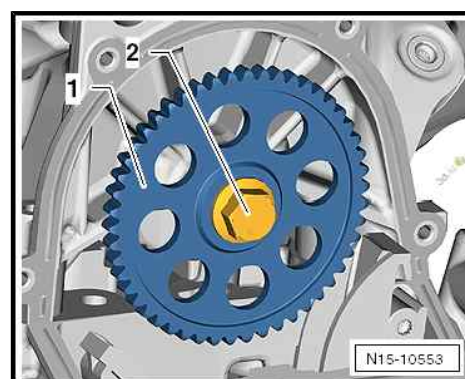
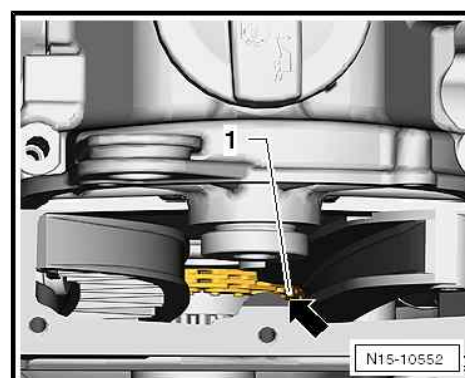
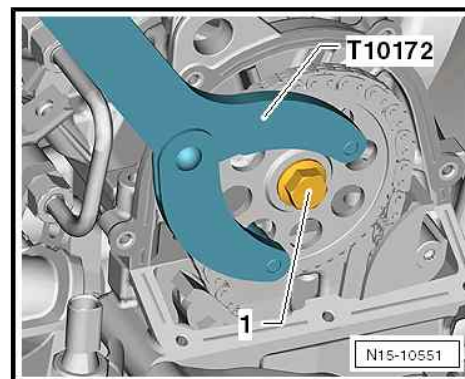
- Position the camshaft sprocket -1- on the camshaft and tighten the fixing screw -2- to 50 Nm.
- Hold the camshaft sprocket with the counterholder -T10172- when tightening.
- Then turn back the crankshaft 90° (1/4 turn) in the opposite direction of rotation of the engine.



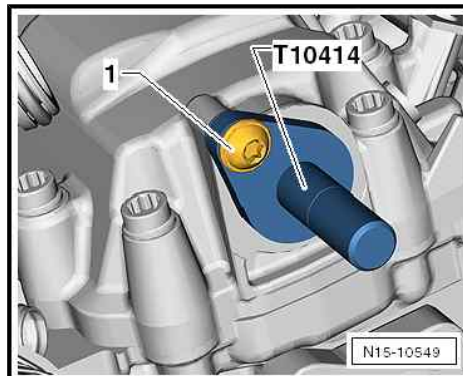
Note

When subsequently adjusting the camshaft, damage to the valves is prevented by turning the crankshaft in the opposite direction of rotation of the engine.

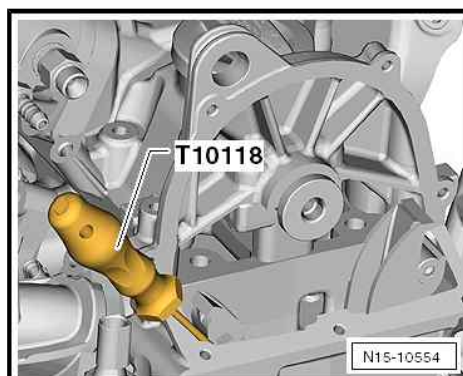
- Turn the camshaft until the grooves -arrows- are in the position shown.



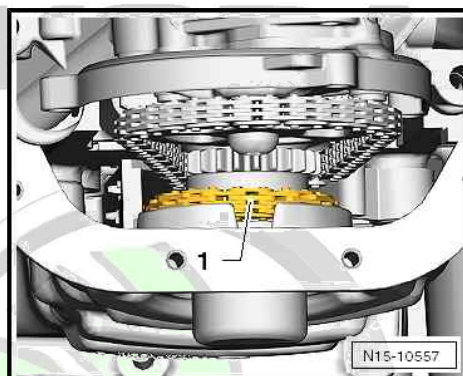
- Insert the locking bolt -T10414- up to the stop into the cylinder head cover.
- Tighten fixing screw -1- by hand.
- Turn crankshaft up to the stop in direction of rotation of engine.



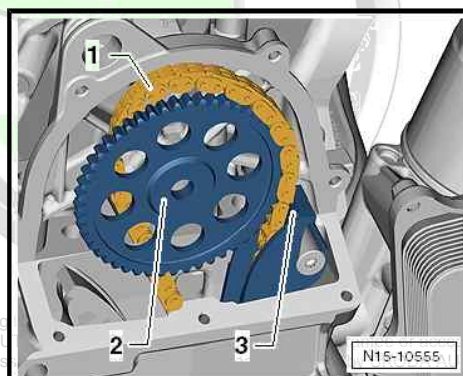
- Lift up the timing chain with the assembly tool -T10118- .



- Check the correct position of the timing chain -1- on the crankshaft gear from below.



- Place the timing chain -1- onto the chain sprocket -2-.
- The timing chain must rest in the area of the sliding rail -3- and be slightly tensioned.



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- Hold the camshaft sprocket with the counterholder -T10172- and tighten the fixing screw -1- of the camshaft sprocket to 50 Nm.

i Note

The fixing screw is only turned a further 90° (1/4 turn) after checking the timing at the end of the work procedure.

- Install chain tensioner and tighten to 60 Nm.
- Remove the locking bolt -T10414- from the camshaft.
- Unscrew the fixing screw -T10340- from the cylinder block.
- Turn the crankshaft two turns in the running direction of the engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Turn crankshaft up to the stop in direction of rotation of engine.

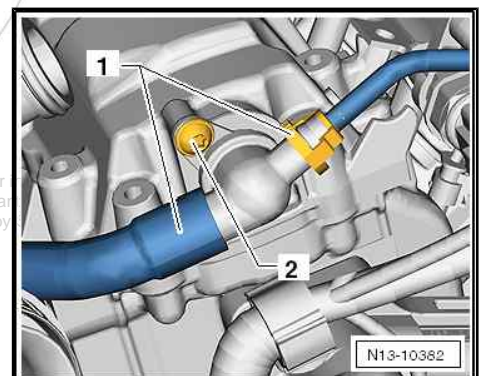
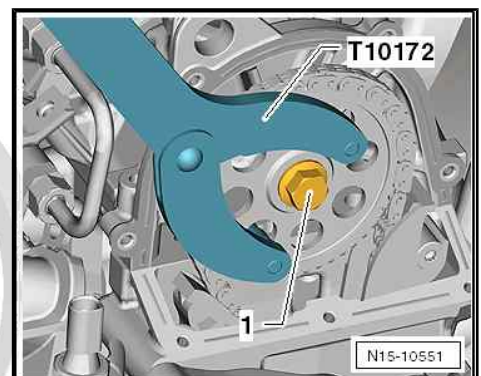
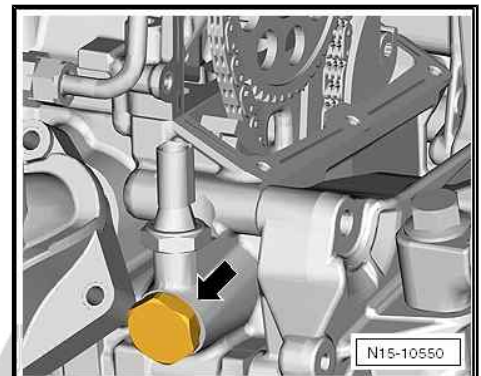
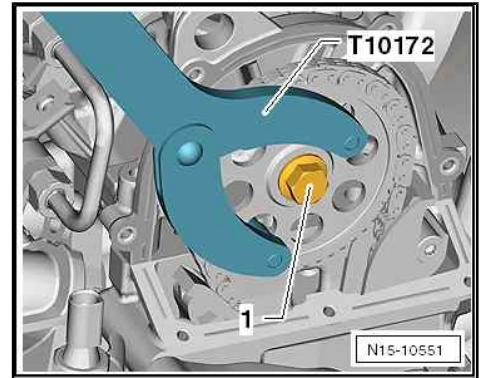
The timing is O.K., if the locking bolt -T10414- can be inserted in the camshaft.

If the timing is not O.K., the setting of the timing must be repeated.

- Hold the camshaft sprocket with the counterholder -T10172- and torque the fixing screw -1- a further 90° (1/4 turn).
- Remove locking bolt -T10414- and fixing screw -T10340-.
- Install top timing case ⇒ [page 33](#).

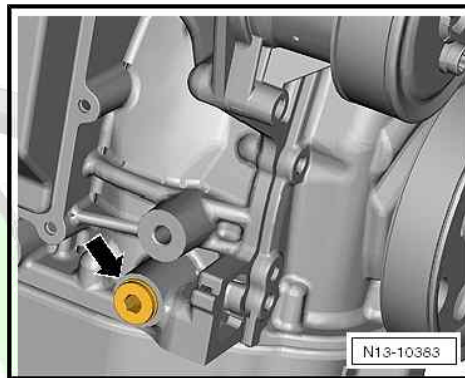
- Install non-return valve. Tightening torque of the fixing screw -2-: 8 Nm.
- Fit on hoses -1-.
- Install oil pan ⇒ [page 93](#).

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- Install screw plug. Tightening torque: 30 Nm
- Top up coolant ⇒ [page 99](#) .

Further installation occurs in reverse order to removal.



1.4 Removing and installing timing chain and drive chain for oil pump



Note

First of all, the timing chain must be removed in order to remove the drive chain for oil pump.

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Remove timing chain ⇒ [page 66](#)

Remove and install the drive chain for oil pump ⇒ [page 70](#)

Install timing chain ⇒ [page 71](#)

Special tools and workshop equipment required

- ◆ Locking bolt -T10414-
- ◆ Locating screw -T10340-
- ◆ Counterholder -T10172 -
- ◆ Counterholder -T30004 (3415)-
- ◆ Bolt -T30004/2 (3415/2)-
- ◆ Assembly device -T10417/1-

1.4.1 Remove timing chain

- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Drain coolant ⇒ [page 99](#) .
- Remove the front right wheelhouse liner ⇒ Body Work ⇒ Rep. Gr. 66 .
- Remove V-ribbed belt ⇒ [page 26](#) .
- Remove top timing case ⇒ [page 33](#) .



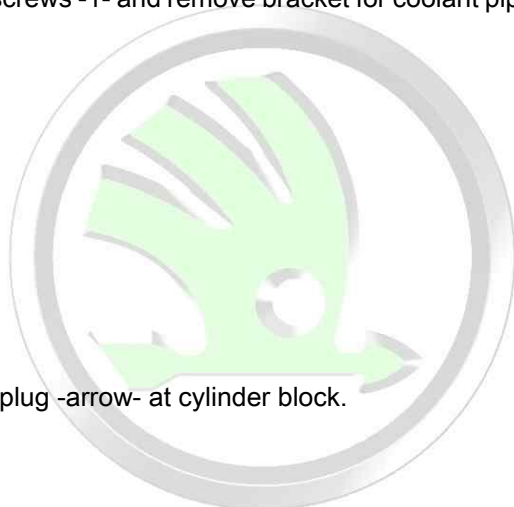
Vehicles with auxiliary heating.

- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

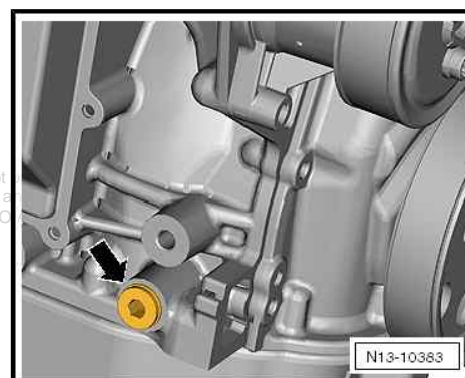
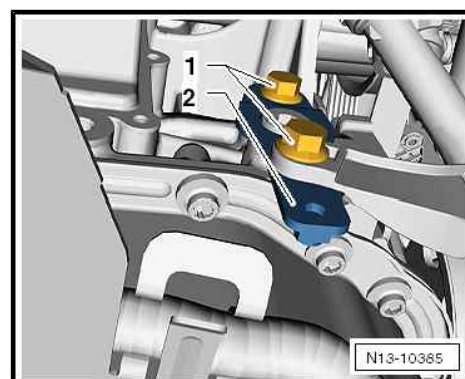
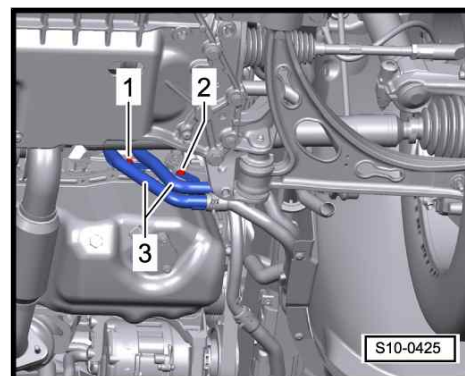
Continued for all vehicles

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- Release fixing screws -1- and remove bracket for coolant pipe -2-.



- Release screw plug -arrow- at cylinder block.



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- Turn the fixing screw -T10340- up to the stop in the cylinder block.



Caution

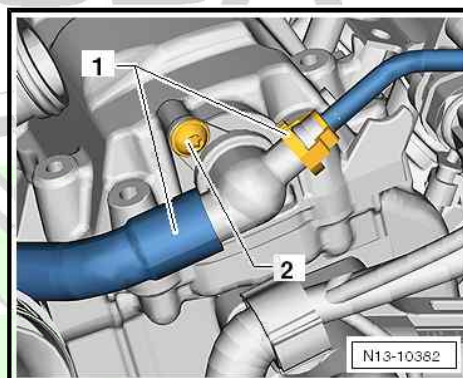
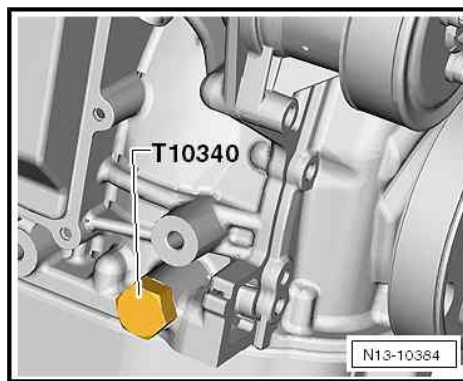
If the fixing screw -T10340- cannot be screwed in up to the stop, the crankshaft is not in the correct position!

In this case proceed as described below.

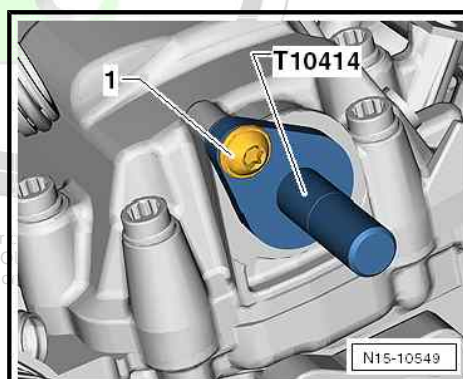
- Unscrew the fixing screw.
- Turn crankshaft 90° ($\frac{1}{4}$ turn) in direction of rotation of engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Tighten fixing screw -T10340- to 30 Nm.
- Turn crankshaft up to the stop in direction of rotation of engine.

The crankshaft is locked in direction of rotation of engine with the fixing screw -T10340- .

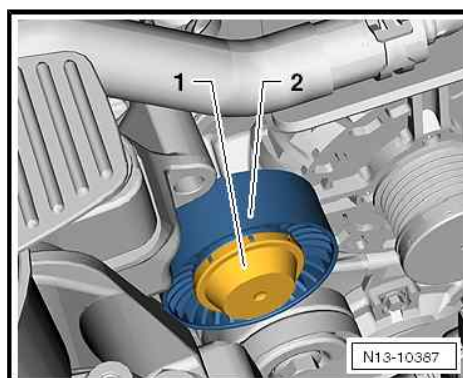
- Pull off both coolant hoses -1- from the non-return valve.
- Release the fixing screw -2- and pull the non-return valve out of the cylinder head cover.



- Insert the locking bolt -T10414- up to the stop into the cylinder head cover.
- Tighten fixing screw -1- by hand.
- Removing the oil pan ➔ [page 93](#) .

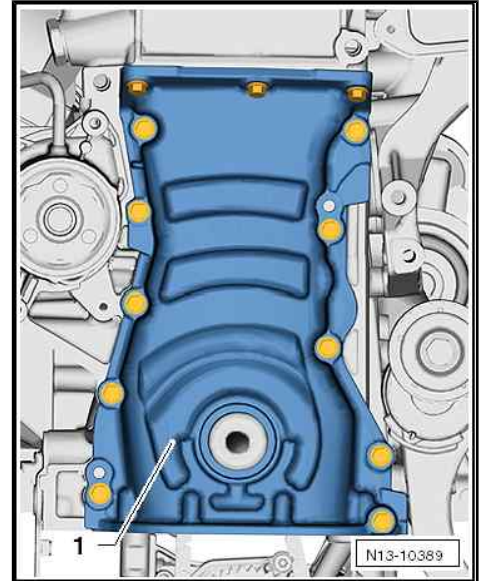


- If present, remove dust cap -1-.
- Remove guide pulley -2-.
- Remove belt pulley for coolant pump, to do so counterhold the belt pulley with the water pump wrench -V.A.G 1590- .
- Remove belt pulley for crankshaft ➔ [page 41](#) .

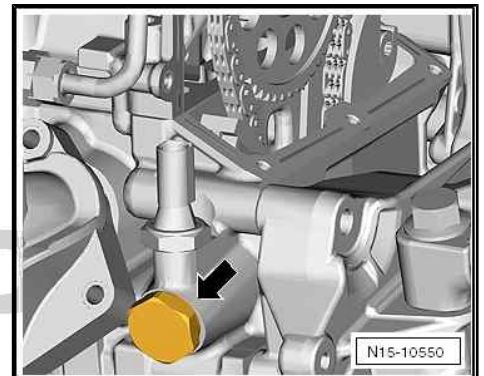


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- Slacken all the fixing screws of the timing case -1- carefully remove the timing case.

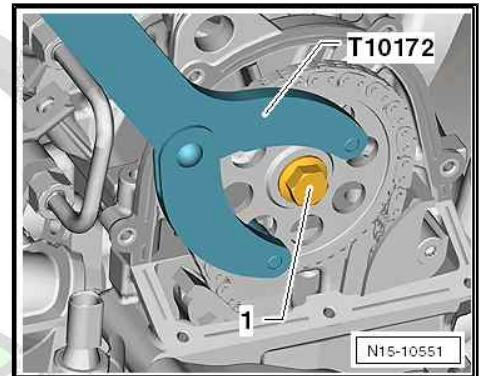


- Release chain tensioner -arrow- for timing chain.
- Mark with a felt-tip pen the direction of rotation of the timing chain.



- Hold the camshaft sprocket with the counterholder -T10172- and slacken the fixing screw -1- of the camshaft sprocket.
- Remove the camshaft sprocket together with the fixing screw.
- Remove timing chain downwards.

Install timing chain ⇒ [page 71](#)

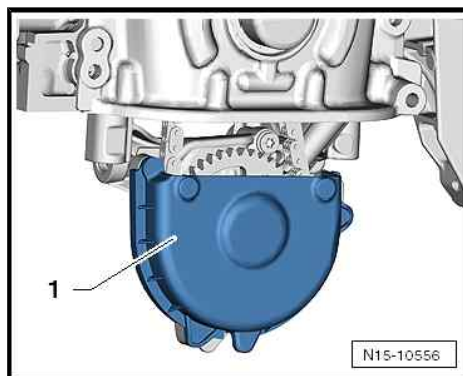


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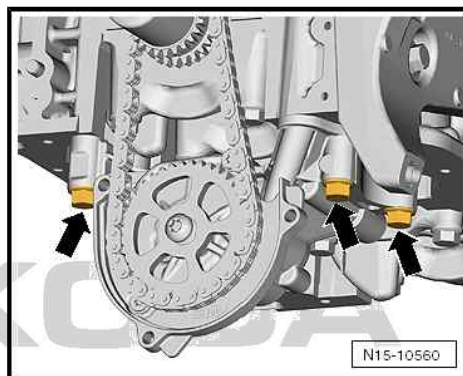
1.4.2 Removing and installing the drive chain for oil pump

Removing

- Pull off the cover -1- from the oil pump.
- Mark with a felt-tip pen the direction of rotation of the drive chain for oil pump.

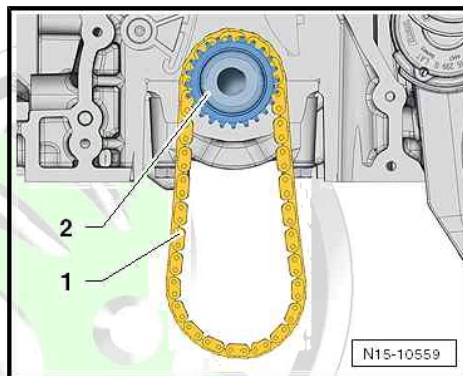


- Unscrew the fixing screws -arrows- of the oil pump.
- Remove the complete oil pump from the drive chain.

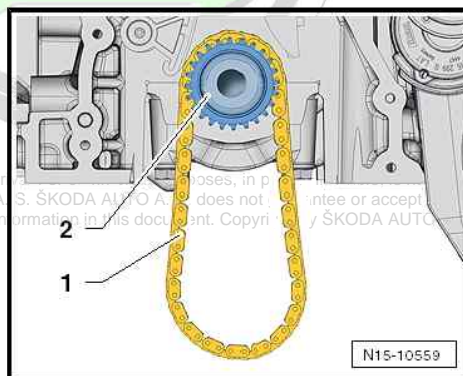


- Remove the drive chain for oil pump -1- from the rear ring gear -2- of the crankshaft gear.

Install



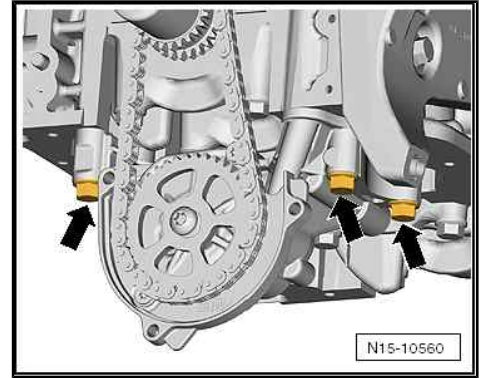
- Place the drive chain for oil pump -1- on the rear ring gear -2- of the crankshaft gear.



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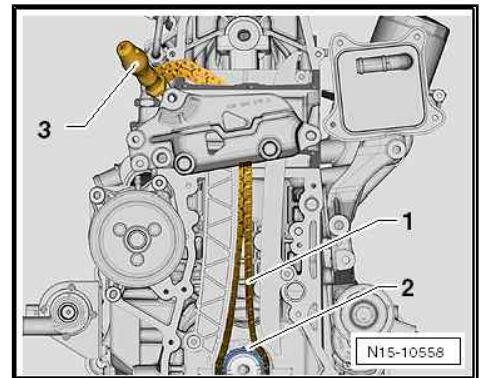
- Hook the oil pump with the chain sprocket into the drive chain and tighten the new screws -arrows- to 14 Nm + torque a further 90° (1/4 turn.).



1.4.3 Installing timing chain

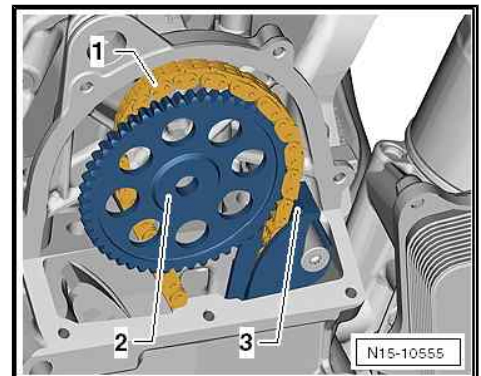
- Position the timing chain -1- from below at the front ring gear -2- and guide it upwards between the sliding rail and the tensioning rail.
- Secure the timing chain, for example with a screwdriver -3-, against falling down.

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- Place the timing chain -1- onto the chain sprocket -2-.

The timing chain must rest in the area of the sliding rail -3- and be slightly tensioned.

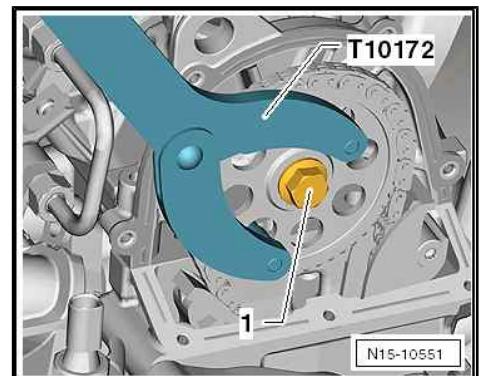


- Hold the camshaft sprocket with the counterholder -T10172- and tighten the fixing screw -1- of the camshaft sprocket to 50 Nm.



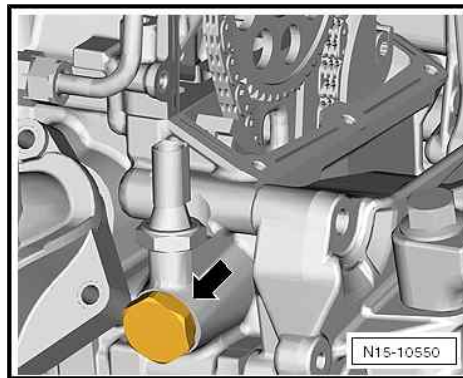
Note

The fixing screw is only turned a further 90° (1/4 turn) after checking the timing at the end of the work procedure.

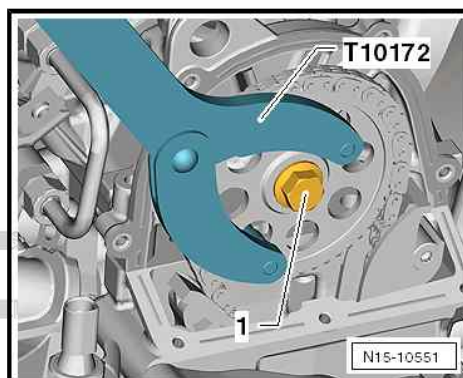


- Tighten chain tensioner -arrow- to 60 Nm.
- Remove the locking bolt -T10414- from the camshaft.
- Unscrew the fixing screw -T10340- from the cylinder block.
- Turn the crankshaft in direction of rotation of engine by 2 turns.
- Test timing ⇒ [page 58](#) .

If timing is o.k.:

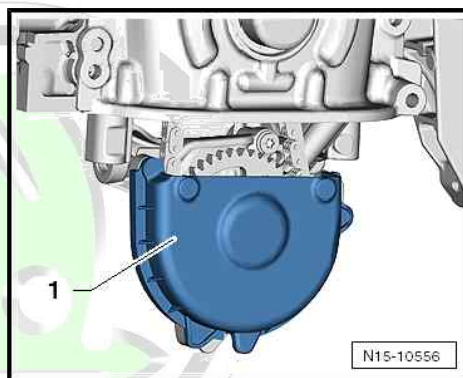


- Hold the camshaft sprocket with the counterholder -T10172- and torque the fixing screw -1- a further 90° (1/4 turn).
- Install bottom timing case ⇒ [page 35](#) .



- Fit the cover -1- on the oil pump.
- Install oil pan ⇒ [page 93](#) .
- Install the crankshaft belt pulley ⇒ [page 41](#) .
- Install the V-ribbed belt ⇒ [page 26](#) .
- Install top timing case ⇒ [page 33](#) .
- Top up coolant ⇒ [page 99](#) .

Further installation occurs in reverse order to removal.



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2 Cylinder head - part 2

2.1 Removing and installing cylinder head cover and camshaft



Note

The camshaft is located in the cylinder head cover.

Special tools and workshop equipment required

- ◆ Locking bolt -T10414-
- ◆ Locating screw -T10340-
- ◆ Counterholder -T10172 -
- ◆ Sealant - D 154 103 A1- (cylinder head cover/cylinder head)
- ◆ Sealant - D 189 500 A1- (cylinder head cover/cylinder head)
- ◆ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Protective goggles and gloves
- ◆ Screw M6x70 (2x) : adapt the screws by sawing off the heads

2.1.1 Remove cylinder head cover

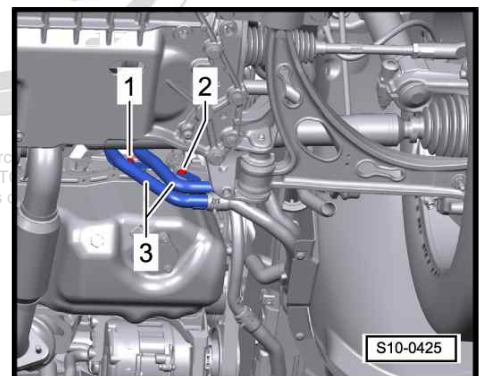
- Disconnect the battery-earth strap with the ignition off ⇒ Electrical System ⇒ Rep. Gr. 27 .
- Remove noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Drain coolant ⇒ [page 99](#) .
- Remove top timing case ⇒ [page 33](#) .

Vehicles with auxiliary heating.

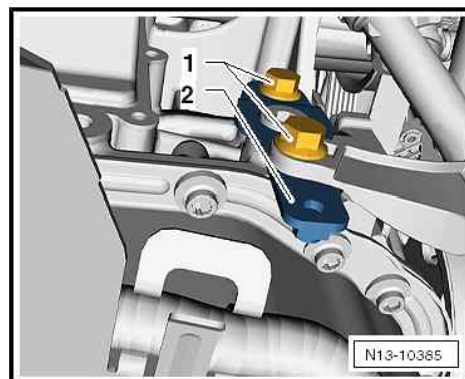
- Unscrew the screws -1 and 2- of the brackets for the coolant pipes for the auxiliary heating -3-.

Continued for all vehicles

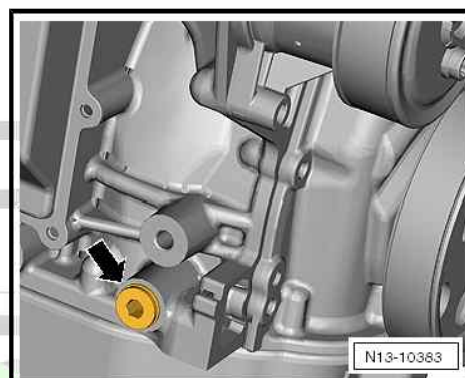
Protected by copyright. Copying for private or commercial use without the written permission of ŠKODA AUTO A. S. is prohibited. The publisher assumes no responsibility for the correctness of information in this manual.



- Release fixing screws -1- and remove bracket for coolant pipe -2-.



- Release screw plug -arrow- at cylinder block.



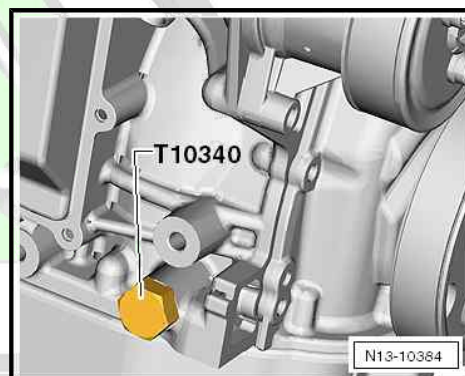
- Turn the fixing screw -T10340- up to the stop in the cylinder block.



Caution

If the fixing screw -T10340- cannot be screwed in up to the stop, the crankshaft is not in the correct position!

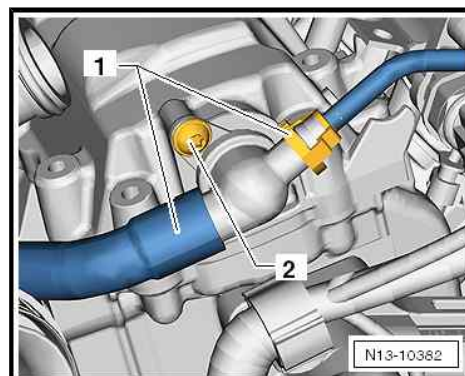
In this case proceed as described below.



- Unscrew the fixing screw.
- Turn crankshaft 90° ($\frac{1}{4}$ turn) in direction of rotation of engine.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Tighten fixing screw -T10340- to 30 Nm.
- Turn crankshaft up to the stop in direction of rotation of engine.

The crankshaft is locked in direction of rotation of engine with the fixing screw -T10340- .

- Pull off both coolant hoses -1- from the non-return valve.
- Release the fixing screw -2- and pull the non-return valve out of the cylinder head cover.



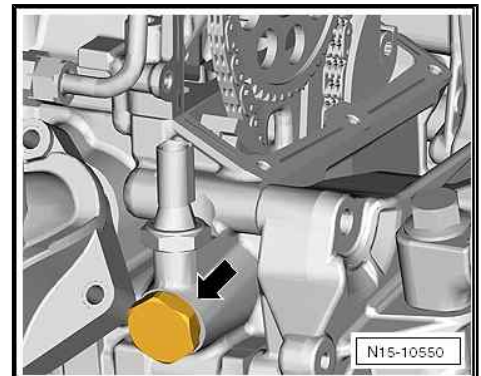
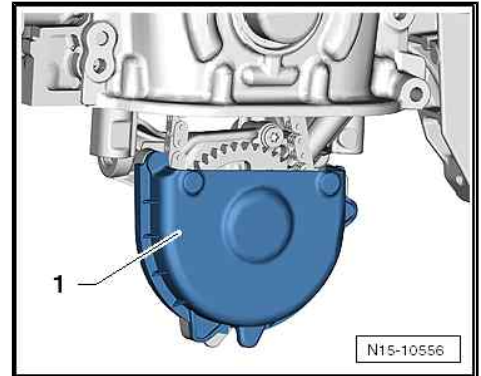
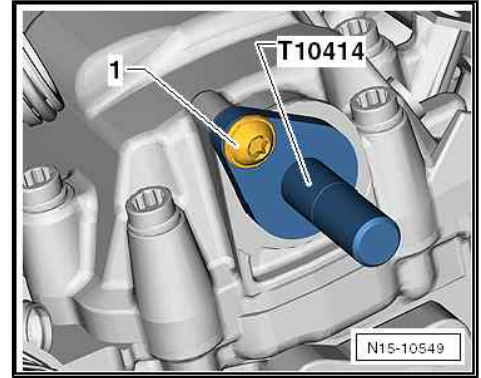
- Insert the locking bolt -T10414- up to the stop into the cylinder head cover.
- Tighten fixing screw -1- by hand.
- Removing the oil pan => [page 93](#) .



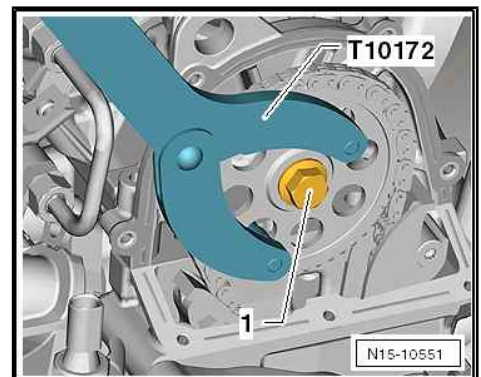
- Pull off the cover -1- from the oil pump.

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- Release chain tensioner -arrow- for timing chain.



- Hold the camshaft sprocket with the counterholder -T10172- and slacken the fixing screw -1- of the camshaft sprocket.
- Remove the camshaft sprocket together with the fixing screw.



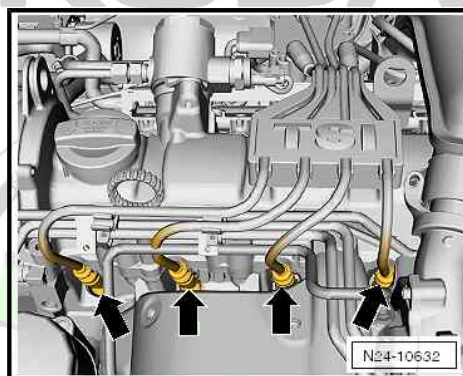
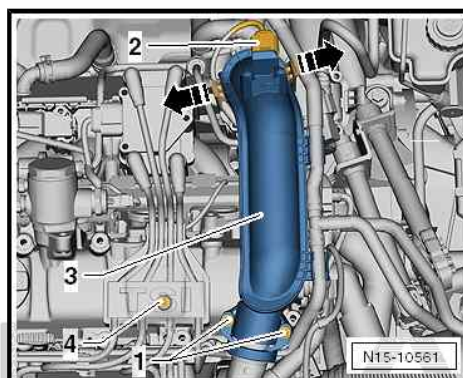
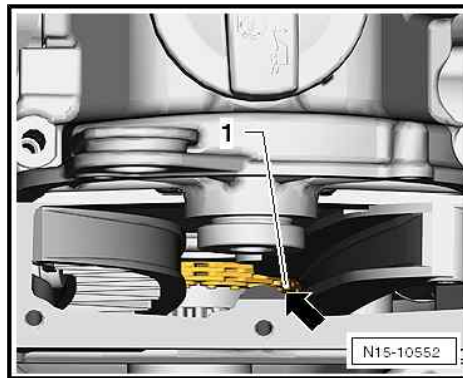
- Place the chain sprocket -1- down on the integrated peg -arrow- in the timing case.



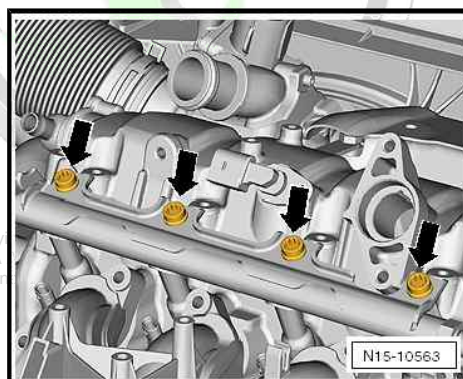
Note

The integrated peg on the inner side of the timing case prevents the chain sprocket from falling down.

- Detach hose to air filter from cylinder head cover.
- Release screws -1- and remove retaining clip.
- Disconnect plug -2- at charge pressure sender -G31- .
- Release the catches in -direction of arrow- and detach the pressure pipe -3- first of all from the throttle valve control unit -J338- and then from the exhaust gas turbocharger.
- Fold open the cover and release the fixing screw -4-.
- Disconnect all the spark plug connectors -arrows- from the spark plugs using the extractor -T10112 A- and lay the ignition cables to the rear.
- Remove the high pressure pump ➔ [page 164](#) .
- Unplug connectors from the fuel injection valves.



- Release the screws -arrows- and disconnect the fuel distributor from the injection valves.
- Remove exhaust turbocharger ➔ [page 144](#) .
- Disconnect the plug from the Hall sender -G40- .
- Pull out oil dipstick.
- Slacken the fixing screws of the cylinder head cover crosswise from outside to inside and unscrew.
- Carefully remove the cylinder head cover.



Note

Ensure that no dirt and sealant residues get into the cylinder head.

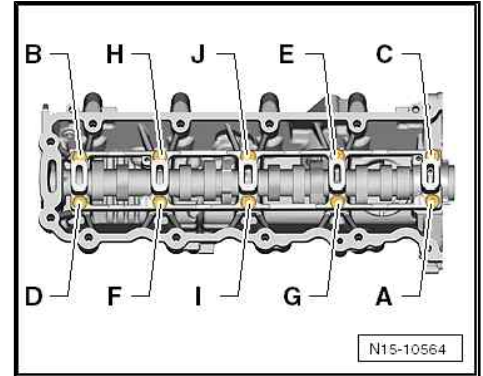
Remove and install camshaft ➔ [page 77](#) .

Install cylinder head cover ➔ [page 78](#) .

2.1.2 Removing and installing camshaft

Removing

- Remove locking bolt -T10414- .
- Place the cylinder head cover on the work bench as shown.
- Release the fixing screws for the bearing frame in the specified order -A- to -J-.
- Remove bearing frame.



- Lift the camshaft -1- out of the cylinder head cover -2-.

Install

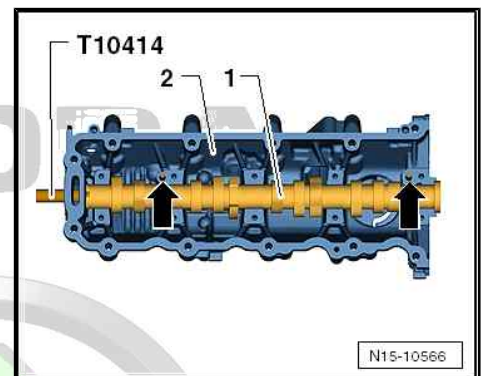
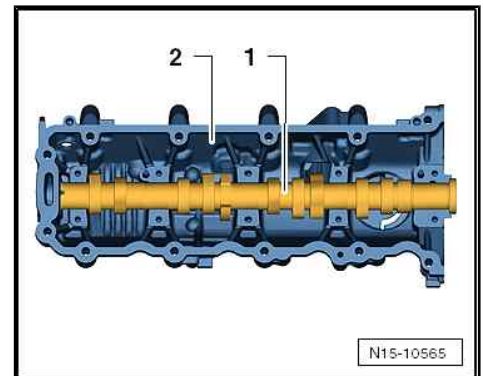


Note

Before fitting, moisten the camshaft and the camshaft bearings lightly with engine oil.

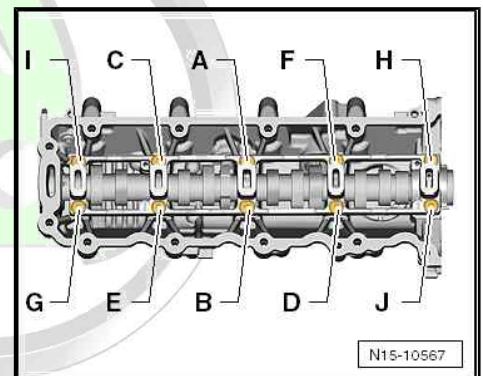
- Place the camshaft -1- in the cylinder head cover -2-.
- Insert the locking bolt -T10414 - into the nuts of the camshaft and tighten the screw by hand.
- Position the bearing frame onto the bearing surfaces of the camshaft.

The bearing frame is put into the correct position by means of the centering pins -arrows-.



- Tighten the fixing screws to 8 Nm in the specified order -A- to -J-.

Install cylinder head cover ⇒ [page 78](#) .



2.1.3 Install cylinder head cover



Caution

Before installing the cylinder head cover, screw in the pin screws (M 6 x 70) at the cylinder head.

The pin screws guide the cylinder head cover and prevent the roller rocker arms sliding off from the supporting elements.

Condition

- The pistons must not be positioned at top dead centre.



WARNING

Wear protective gloves when working with sealant and grease remover!

- Remove residual sealant from the sealing surfaces at the cylinder head cover and at the cylinder head with chemical sealant remover.
- Degrease the sealing surfaces.
- Screw in two pin screws (M 6 x 70) -1- into the cylinder head before fitting on the cylinder head cover.



Caution

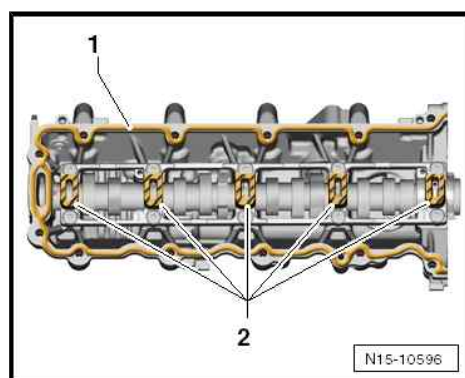
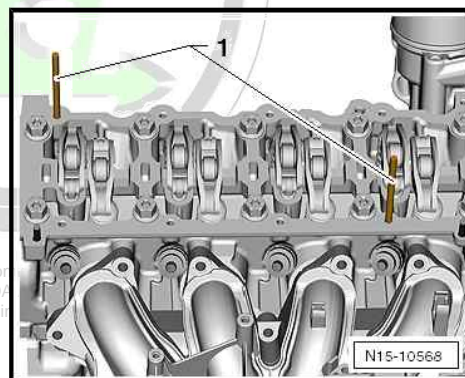
The cylinder head cover is sealed with 2 different sealants!



Note

The sealant must not be applied too thickly, as otherwise excess sealant may penetrate into the oil bores and possibly cause engine damage.

- Apply sealant -D 189 500 A1 - on the sealing surface -1-.
The sealant bead must be 2...3 mm thick and must run past the area around the bolt holes on the inside.
- Apply a thin layer of sealant -D 154 103 A1 - evenly to the gridded sealing surfaces -2-.
- Check if the roller rocker arms rest on the supporting elements.
- Carefully fit the cylinder head cover over the pin screws and position the dowel pins onto the cylinder head.



- Tighten the new fixing screws of the cylinder head cover in the specified order -A- to -J-.

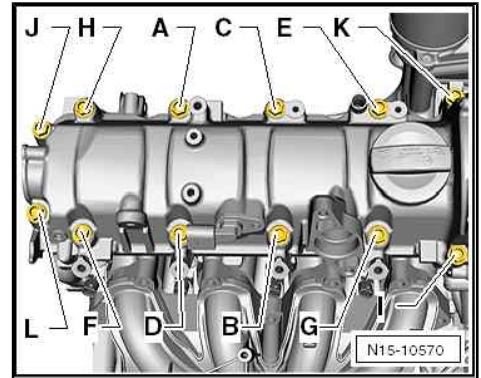
Tightening torque: 8 Nm + torque a further 90° (1/4 turn).



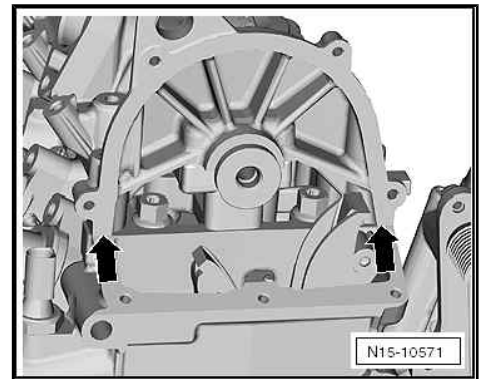
Caution

The sealant for the cylinder head cover must absolutely be removed in the area of the -arrows-.

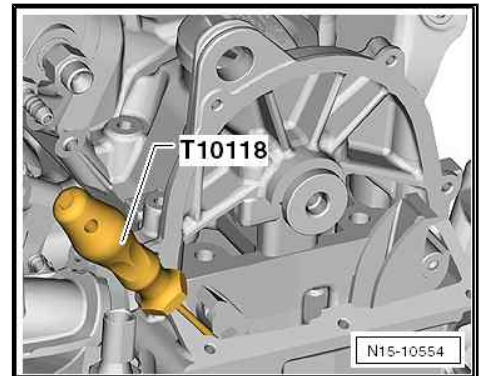
In order to avoid leakage, the sealant for the cylinder head cover and the sealant for the timing case must not mix.



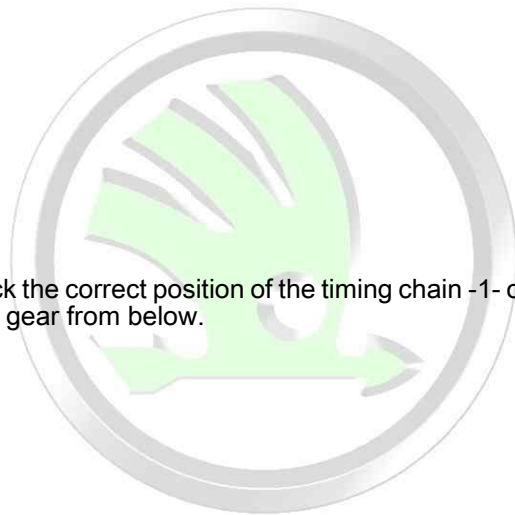
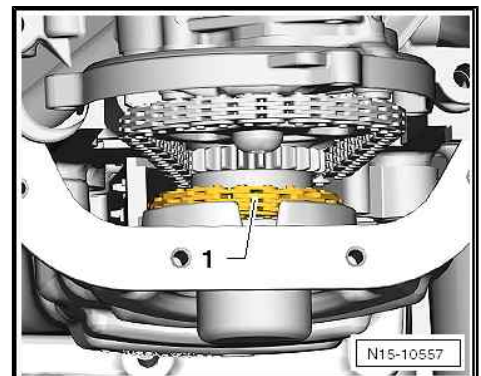
- Remove excess sealant in the area of the -arrows-.
- Turn crankshaft up to the stop in direction of rotation of engine.



- Lift up the timing chain with the assembly device -T10118 - .



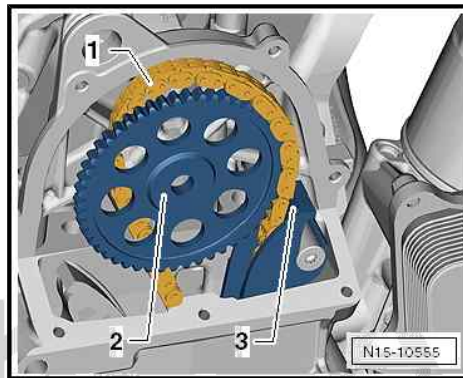
- Check the correct position of the timing chain -1- on the crankshaft gear from below.



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- Place the timing chain -1- onto the chain sprocket -2-.

The timing chain must rest in the area of the sliding rail -3- and be slightly tensioned.

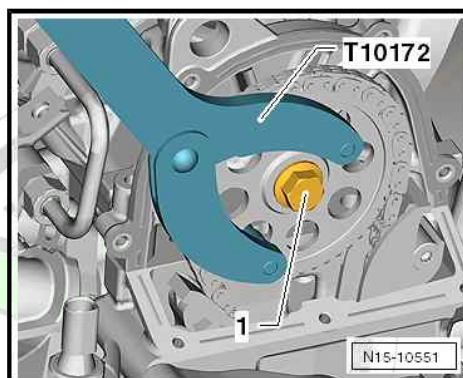


- Hold the camshaft sprocket with the counterholder -T10172- and tighten the fixing screw -1- of the camshaft sprocket to 50 Nm.



Note

The fixing screw is only turned a further 90° (1/4 turn) after checking the timing at the end of the work procedure.



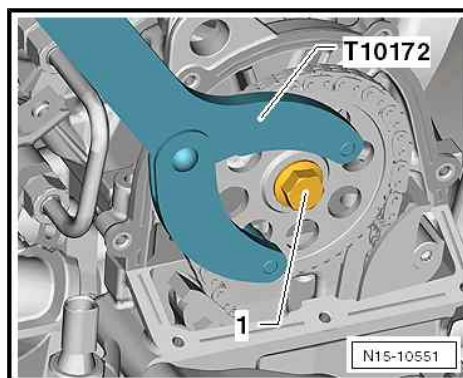
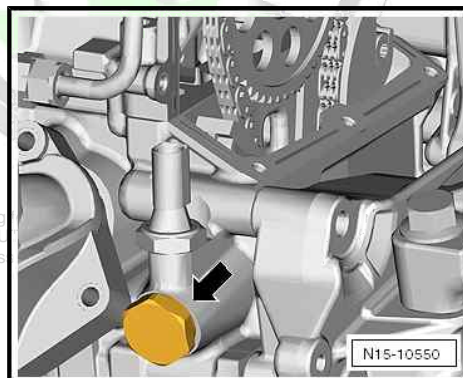
- Tighten chain tensioner to 60 Nm.
- Remove the locking bolt -T10414- from the camshaft.
- Release the fixing screw -T10340- from the cylinder block.
- Turn the crankshaft in direction of rotation of engine by 2 turns.
- Turn the fixing screw -T10340- up to the stop in the cylinder block.
- Turn crankshaft up to the stop in direction of rotation of engine.

The timing is O.K., if the locking bolt -T10414- can be inserted in the camshaft.

If the timing is not O.K.:

- Repeat the setting of the timing ⇒ [page 60](#) .
- Hold the camshaft sprocket with the counterholder -T10172- and torque the fixing screw -1- a further 90° (1/4 turn).
- Remove locking bolt -T10414- and fixing screw -T10340- .
- Install top timing case ⇒ [page 33](#) .
- Install exhaust turbocharger ⇒ [page 144](#) .
- Installing the oil pan ⇒ [page 93](#) .
- Install the crankshaft belt pulley ⇒ [page 41](#) .
- Install high pressure pump ⇒ [page 164](#) .
- Install fuel lines ⇒ [page 163](#) .

Further installation occurs in reverse order to removal.



2.2 Removing and installing cylinder head

Special tools and workshop equipment required

- ◆ Supporting device -T30099-
- ◆ Shim -T30099/1-
- ◆ Support -T10358-
- ◆ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Protective goggles and gloves

Removing

Requirements

- The engine temperature should not exceed 35°C, because the cylinder head could be twisted when slackening the screws.
- The pistons must not be in TDC.

Observe safety measures ⇒ [page 3](#) .

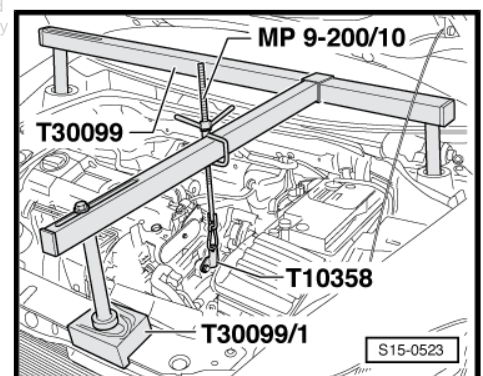
Observe rules for cleanliness ⇒ [page 5](#) .



WARNING

**Release pressure in the high pressure area of the fuel system
⇒ [page 4](#) .**

- Drain the coolant from the cooling system ⇒ [page 99](#) .
- Remove coolant regulator housing from cylinder head.
- Remove top timing case ⇒ [page 33](#) .
- Remove bottom timing case ⇒ [page 35](#) .
- Remove exhaust turbocharger ⇒ [page 144](#) .
- Removing the intake manifold ⇒ [page 159](#) .
- Fit supporting device -T30099- .
- Unscrew the fixing screw for the gearbox and screw down the bracket -T10358- as shown: (The figure shows the version with the 1.4 ltr./90 kW TSI Engine; the engine mounting is identical).
- Support the engine via the spindle in its installed position and slightly pre-tension.

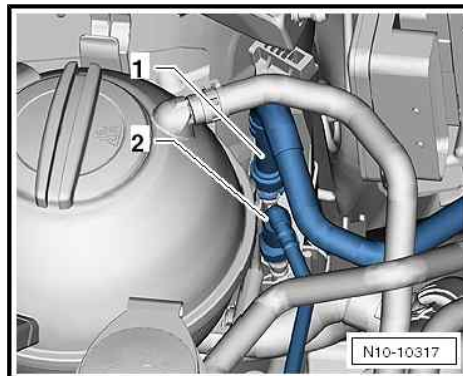


- Disconnect the fuel feed line -1- and the cable to the activated charcoal filter -2-. To do so press the release buttons.

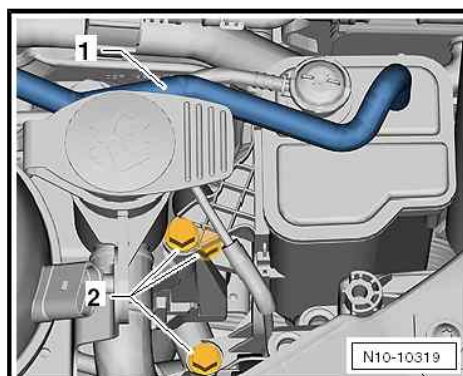


WARNING

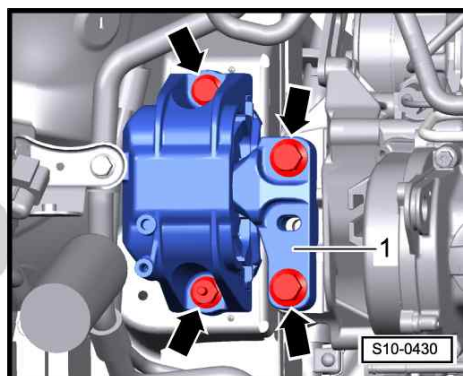
The fuel feed line is pressurized! Wear safety goggles and safety gloves, in order to avoid injuries and skin contact. Place cleaning cloths around the connection point before detaching hose connections. Reduce pressure by carefully removing the hose.



- Release the fixing screws -2- and pull the activated charcoal filter upwards.

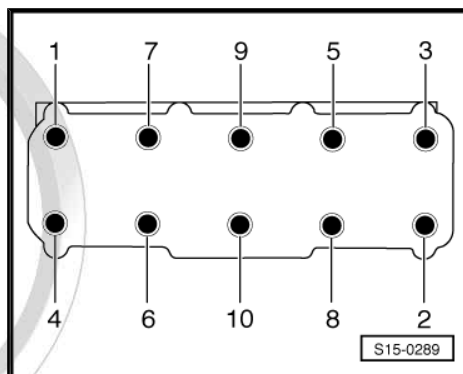


- Unscrew screws -arrows- and remove engine mounting.
- Remove cylinder head cover ➤ [page 73](#).
- Remove the tensioning rail and the sliding rail of the timing chain.
- Remove the roller rocker arm together with the supporting elements and lay aside on a clean surface.
- Ensure that the roller rocker arms and the supporting elements are not mixed up.



- Release the cylinder head bolts in the specified sequence and remove.
- Carefully remove the cylinder head.

Install





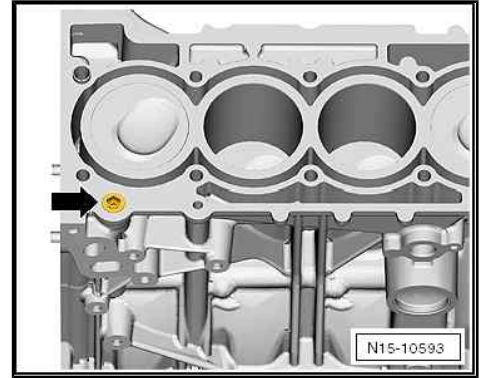
Tightening torque of non-return valve -arrow-: 7 Nm.

Condition

- The pistons must not be in TDC.

Note

- ◆ Remove the new cylinder head gasket from its wrapping immediately before fitting.
- ◆ Treat the new gasket with the utmost care. Any damage will result in leaks.
- ◆ There must be no oil or coolant in the blind holes of the cylinder head bolts in the cylinder block.
- Stuff clean cloth into the cylinders to avoid any dirt getting in between cylinder wall and piston.



WARNING

Wear protective gloves when working with sealant and grease remover!

- Make sure that when cleaning the cylinder head and cylinder block no foreign bodies can get into the cylinder or into the oil and coolant galleries.
- Carefully remove old sealant residue from the cylinder head and cylinder block using a chemical sealant remover.
- Position piston of cylinder 1 to top dead centre and slightly turn the crankshaft anticlockwise again.
- Position the new cylinder heads. The legend (part number) must be legible.
- Insert the cylinder head. Pay attention to the centering pins in the cylinder block.
- Insert new cylinder head bolts and tighten by hand.

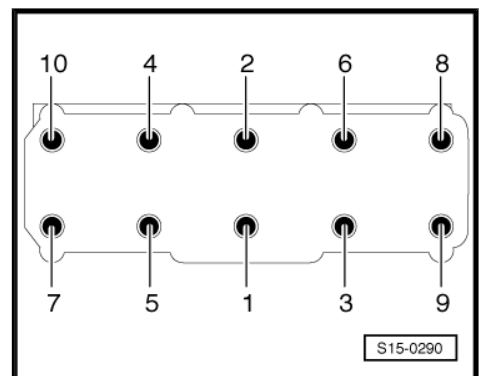
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- Tighten cylinder head bolts in the tightening order shown as follows:

- ◆ Tighten all screws to 40 Nm.
- ◆ Then, torque all bolts further to 90° (1/4 turn) with a rigid wrench.
- ◆ Then once again turn all bolts through a further 90° (1/4 turn).
- Insert the supporting elements in the cylinder head and position the relevant roller rocker arm on the valve stem ends or supporting elements.
- Install cylinder head cover ➔ [page 73](#) .
- Setting the timing ➔ [page 60](#) .

Further installation occurs in reverse order to removal.

- Top up and bleed cooling system ➔ [page 99](#) .



2.3 Testing the compression

Special tools and workshop equipment required



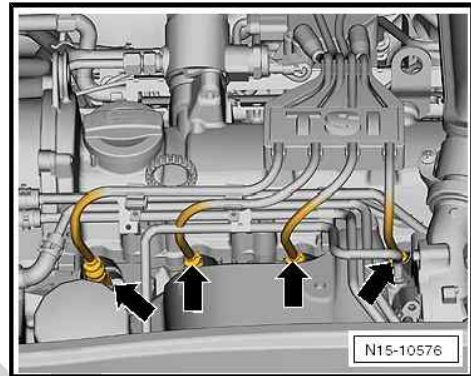
- ◆ Spark plug wrench -3122 B-
- ◆ Compression tester -V.A.G 1763-
- ◆ Extractor -T10112 A-

Test condition

- Engine oil temperature must be at least 30°C.

Work procedure

- Pull out the spark plug connector -arrows- with the extractor -T10112 A- .
- Unscrew the spark plugs with the spark plug wrench -3122 B- .
- Open lid of fuse carrier in the engine compartment and unplug the fuse for fuel pump control unit ⇒ Current flow diagrams and Fitting locations.
- Check compression pressure using the compression tester -V.A.G 1763- .



Note

Use of tester ⇒ *Operating Instructions* .

- Operate starter until the tester no longer indicates a pressure rise.

Compression readings

New engine	Wear limit	Difference between cylinders
1...1.5 MPa (10...15 bar)	0.7 MPa (7 bar)	0.3 MPa (3 bar)

If the specified values are not reached, test the combustion chamber for tightness ⇒ [page 84](#) .

Further installation occurs in reverse order to removal. Pay attention to the following:

- Delete the contents of the fault memory for the engine control unit at the end of the work as error messages were stored due to disconnecting the plugs ⇒ Vehicle diagnosis, testing and information system VAS 5051.

2.4 Check combustion chamber for tightness

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Special tools and workshop equipment required

- ◆ Pressure hose -MP1-210 (VW 653/3)- (replace gasket ring with a spark plug gasket ring)
- ◆ Extractor -T10112 A-
- ◆ Spark plug wrench -3122 B-

Test sequence

- Unscrew the spark plugs with the spark plug wrench -3122 B- .
- Position piston of the relevant cylinder to dead centre.
- Screw the pressure hose MP 1-210 into the spark plug thread.
- Connect pressure hose to compressed air.



- With the assistance of a second mechanic, lock the screw at the crankshaft on TDC position in order to avoid the displacement of the piston after pressure build-up.
- Build up a pressure of approx. 0.3 MPa (3 bar) in the combustion chamber.
- Determine how the pressure escapes:
 - 1 - Via the inlet valve(s) - the pressure enters the throttle valve.
 - 2 - Via the outlet valve(s) - the pressure enters the exhaust system.
 - 3 - Via the piston rings – the pressure enters the cylinder block.

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3 Valve gear

3.1 Valve gear - Summary of components

1 - 50 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

2 - Camshaft sprocket

- ☐ take note of the position when installing the timing chain

3 - 10 Nm

4 - Hall sender -G40-

- ☐ with O-ring
- ☐ replace the O-ring if it is damaged

5 - Cylinder head cover

- ☐ removing and installing
⇒ [page 73](#)

6 - Non-return valve

7 - 10 Nm

8 - O-ring

- ☐ replace if damaged
- ☐ before fitting moisten lightly with engine oil

9 - Camshaft

- ☐ removing and installing
⇒ [page 73](#)
- ☐ Inspecting axial play
⇒ [page 87](#)
- ☐ moisten with oil before installing (also axial bearing collar)

10 - Valve collet

11 - Valve spring retainer

12 - Valve stem seal

- ☐ replace

13 - Valve spring

- ☐ with the cylinder head removed, remove and install with blank holder -3362-
- ☐ (with cylinder head installed) ⇒ [page 88](#)

14 - Valve guide

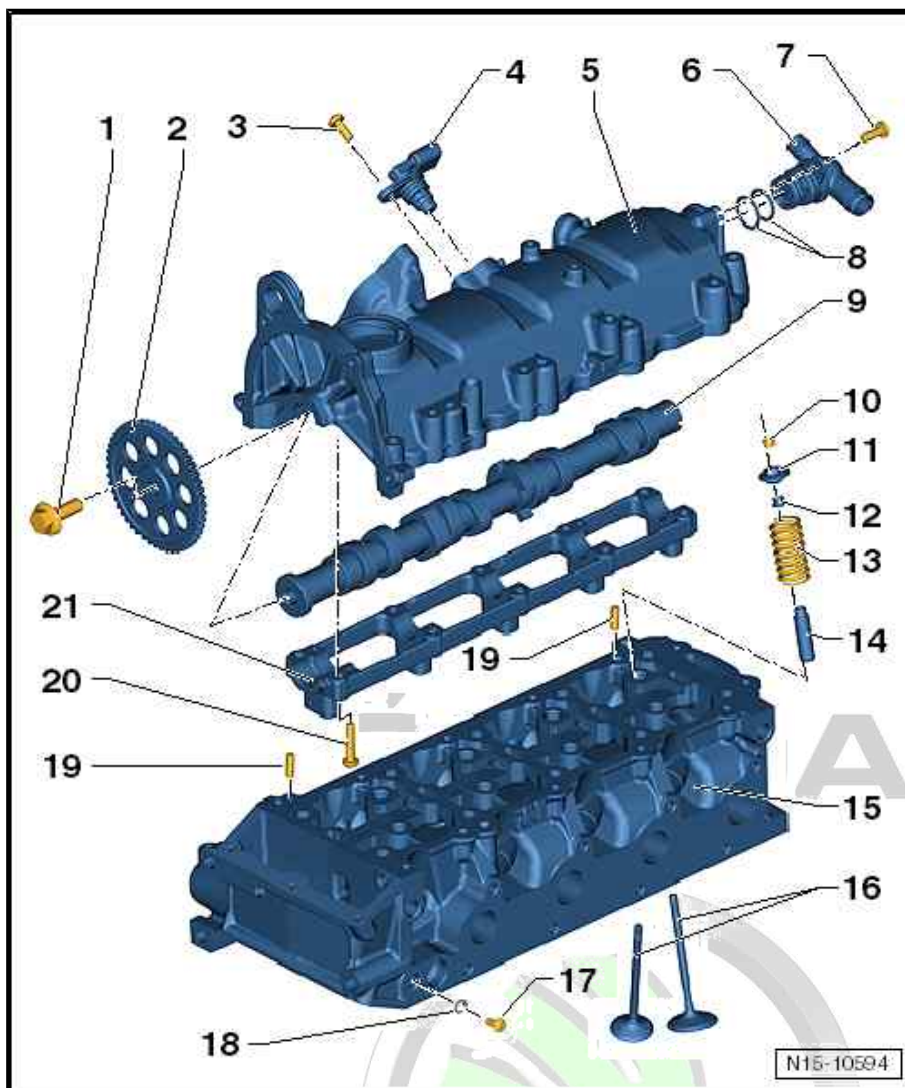
- ☐ check ⇒ [page 87](#)

15 - Cylinder head

- ☐ removing and installing ⇒ [page 80](#)

16 - Valves

- ☐ do not rework, only grinding in is permissible
- ☐ Valve dimensions ⇒ [page 87](#)



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17 - 15 Nm

18 - Gasket

- ☐ replace

19 - Dowel pins

20 - 8 Nm

- ☐ observe the order of tightening up
- ☐ removing and installing ⇒ [page 73](#)

21 - Bearing frame

- ☐ for camshaft
- ☐ removing and installing ⇒ [page 73](#)

3.2 inspect camshaft, axial play

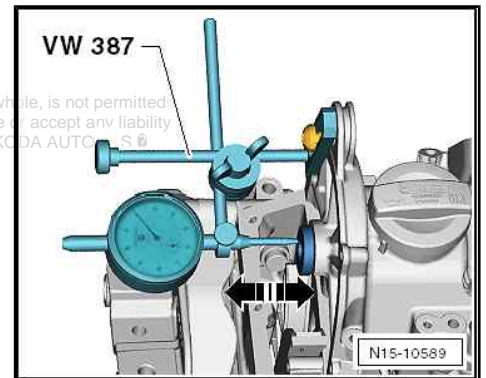
Special tools and workshop equipment required

- ◆ Universal dial gauge holder -MP 3-447 (VW 387)-
- ◆ Dial gauge

Perform measurement with the cylinder head cover installed.

Checking the axial play of the camshaft

- Wear limit: 0,4 mm



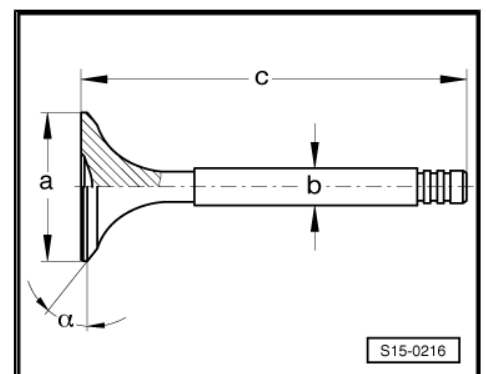
Valve dimensions



Note

Valves must not be reworked. Only grinding in is permissible.

Dimension		Inlet valve	Exhaust valve
Ø a	mm	35,5	30,0
Ø b	mm	5,98	5,96
c	mm	98,67	98,36
α	°	44° 50'	44° 50'



3.3 Inspect valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge holder -MP 3-447 (VW 387)-
- ◆ Dial gauge



Work procedure



Note

If the valve is replaced when carrying out repair work, use a new valve for the measurement.

- Insert valve into guide. End of valve stem must be flush with guide. Because of the different stem diameters only use inlet valve in inlet guide or outlet valve in outlet guide.
- Determine valve rock.
- Wear limit: 0.8 mm

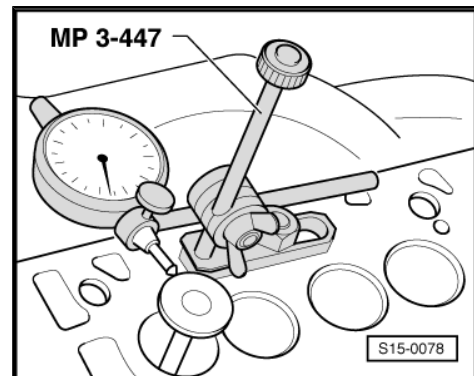


Note

If the wear limit is exceeded, repeat measurement with new valves.

If the valve rock is exceeded:

- Replace the cylinder head.



3.4 Replacing valve stem seal

Special tools and workshop equipment required

- ♦ Spark plug wrench -3122 B-
- ♦ Valve lever -MP 1-211 (VW 541/1A/5) -
- ♦ Pressure hose -MP 1-210 (VW 653/3)-
- ♦ Assembly device -MP 1-213 (2036)-
- ♦ Valve supporting plate -MP 1-218-
- ♦ Insertion tool - MP 1-233 (3365)-
- ♦ Valve stem seal extractor -MP 1-230 (3364)-

Removing



Note

With cylinder head removed, use valve lever -MP 1-211- , assembly device for valves -MP 1-213- and valve supporting plate -MP 1-218- .

With cylinder head installed:

- Remove cylinder head cover ➔ [page 73](#) .
- Remove roller rocker arm and place on a clean surface. Make sure the roller rocker arms are not interchanged.
- Unscrew the spark plugs with the spark plug wrench -3122 B- .
- Put the piston of the relevant cylinder at “bottom dead centre”.

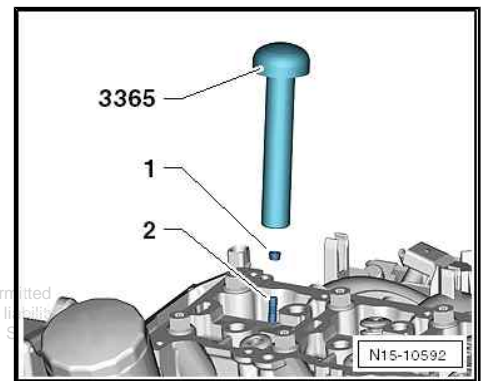
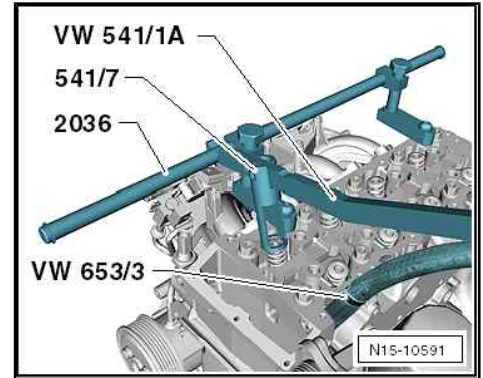
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- Screw the assembly device -MP 1-213 (2036)- onto the cylinder head.
- Screw the pressure hose -MP 1-210 (VW 653/3)- in the spark plug thread.
- Connect pressure hose to compressed air [min. 0.6 MPa (6 bar) overpressure] and remove the valve spring with valve lever -MP 1-211 (VW 541/1A/5) - and pressure plate -VW 541/7- .
- Pull off valve stem seal with extractor for valve stem seal -MP 1-230 (3364)- .

Install

- Insert the supplied plastic bushings on the relevant valve stem. This will prevent any damage to the new valve stem seals.
- Insert the new valve stem seal -1- into the insertion tool for valve stem seal -MP 1-233 (3365)- .
- Oil the sealing lip of the valve stem seal and carefully slide over the valve -2- onto the valve guide.
- Installing camshaft housing ⇒ [page 73](#) .

The further assembly is carried out in reverse order to disassembly.



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17 – Lubrication

1 Lubrication system



Note

- ♦ *The oil level must not be above the max. marking - risk of damage to catalytic converter!*
- ♦ *If considerable quantities of metal swarf or abrasion is found when carrying out engine repairs, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:*
 - Carefully clean the oil galleries.
 - Replace oil spray jets.
 - Replace engine oil cooler.
 - Replace oil filter.

Inspecting oil pressure ⇒ [page 96](#) .

Check the engine oil, amount of oil and oil specification ⇒ Maintenance ; Octavia II .

1.1 Summary of components



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1 - Screw cap

- ☐ replace damaged gas-
ket

2 - Oil feed line

- ☐ to exhaust gas turbo-
charger

3 - Dipstick

- ☐ oil level must not exceed
max. marking!

**4 - Bracket for top auxiliary
units**

- ☐ removing and installing
⇒ [page 27](#)

5 - Gasket

- ☐ replace if damaged

6 - Guide bushing

7 - Oil filter, 20 Nm



Note

*When removing, make
oil does not penetrate in
erator! Therefore, cover
ator with a clean cloth!*

- ☐ with gasket rings
- ☐ with non-return valve
- ☐ slacken and tighten with
oil filter wrench -3417-
- ☐ Keep to change inter-
vals ⇒ Maintenance ;
Octavia II

8 - 25 Nm

9 - Gasket

- ☐ replace if damaged

10 - 8 Nm + torque a further 90° (1/4 turn)

- ☐ replace

11 - Engine oil cooler

- ☐ removing and installing ⇒ [page 95](#)

12 - 8 Nm

13 - Top timing case

- ☐ removing and installing ⇒ [page 33](#)



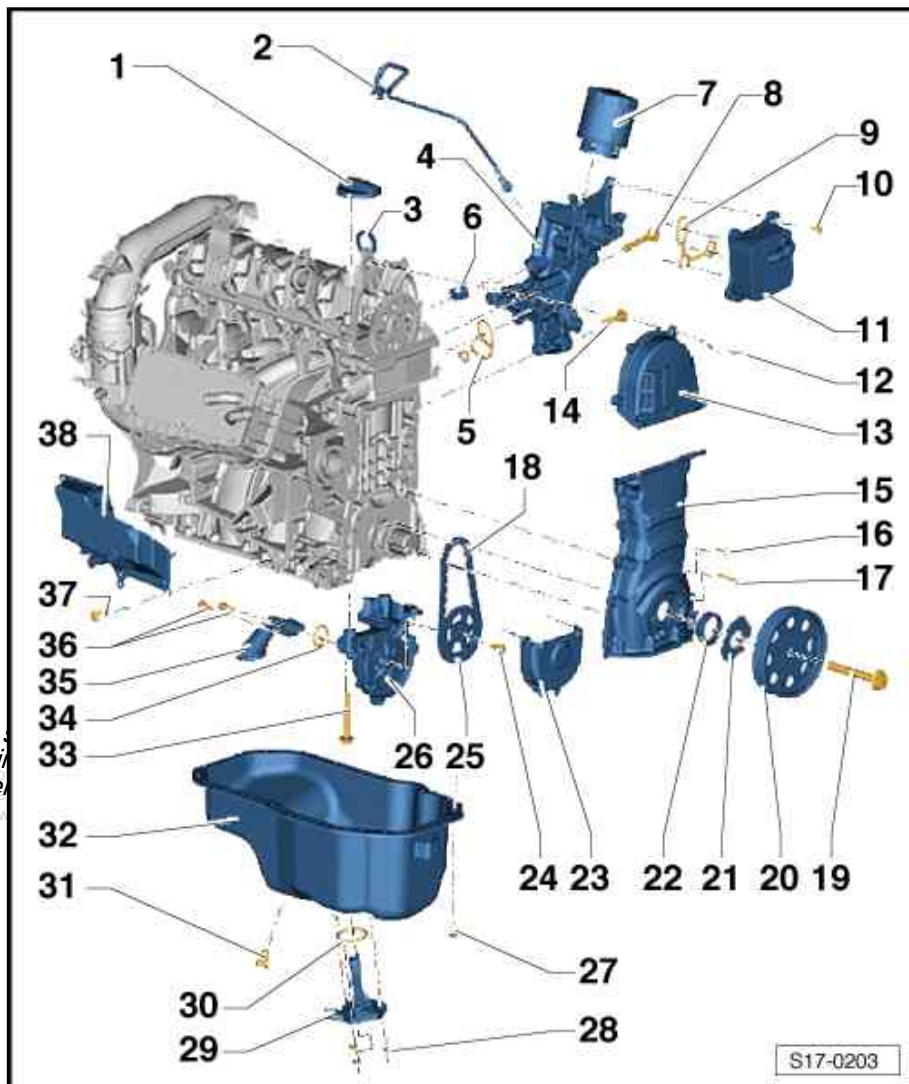
Caution

*Pay attention to tighten-
ing process!*

14 - 25 Nm

15 - Bottom timing case

- ☐ removing and installing ⇒ [page 35](#)



**16 - 5 Nm + torque a further 30°**

- ☐ Screw: M6x20

17 - 5 Nm + torque a further 30°

- ☐ Screw: M6x40

18 - Drive chain

- ☐ removing and installing ⇒ [page 66](#)
- ☐ for oil pump
- ☐ mark running direction (installed position) before removing

19 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -3415- to prevent it from turning

20 - Belt pulley

- ☐ Pay attention to tightening process ⇒ [page 41](#)
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Secure belt pulley with counterholder -T30004 (3415)- with bolts -T30004/2 (3415/2)- to prevent it from turning

21 - Diamond coated washer

- ☐ replace

22 - Sealing ring

- ☐ replace
- ☐ removing and installing ⇒ [page 40](#)

23 - Bottom cover**24 - 20 Nm + torque a further 90° (1/4 turn)****25 - Sprocket**

- ☐ for oil pump drive
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Lock chain sprocket with counterholder -T10172-

26 - Oil pump

- ☐ removing and installing ⇒ [page 95](#)
- ☐ must be replaced completely

27 - 13 Nm

- ☐ replace
- ☐ slacken and tighten only the bolts at the gearbox side with socket insert -T10058-

28 - 10 Nm**29 - Oil level and oil temperature sender -G266 -**

- ☐ replace if damaged
- ☐ check ⇒ [Current flow diagrams and Fitting locations](#)

30 - Sealing ring

- ☐ replace if damaged

31 - Drain plug, 30 Nm

- ☐ with captive seal
- ☐ replace

32 - Oil pan

- ☐ removing and installing ⇒ [page 93](#)



33 - 14 Nm + torque a further 90° (1/4 turn)

34 - Sealing ring

□ replace

35 - Suction line

36 - 8 Nm

37 - 8 Nm

38 - Oil separator

install with sealant -D 176 501 A1-

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1.2 Removing and installing oil pan

Special tools and workshop equipment required

- ◆ Socket insert -T10058-
- ◆ Sealant remover gasket stripper (bearing code GST, part number R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Protective goggles and gloves
- ◆ Silicone sealant -D 176 600 A1-
- ◆ Catch pan , e.g. -VAS 6208-

Removing

- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Drain engine oil ⇒ Maintenance ; Octavia II .
- Remove exhaust pipe Pos. 9 ⇒ [page 178](#) .
- Disconnect plug at oil level and oil temperature sender - G266- .

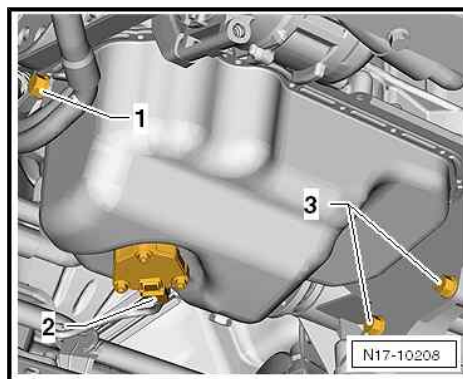
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- Release screw -1- from bracket for coolant pipe.
- Unscrew both fixing screws -3- and remove the bottom cover plate.
- Loosen bolts for oil pan crosswise and release.
- Remove oil pan, if necessary release by applying slight blows with a rubber-headed hammer.



WARNING

Wear protective gloves when working with sealant and grease remover!



- Remove the remaining sealant on the cylinder block and on the oil pan with chemical sealant remover.
- Degrease the sealing surfaces.

Install



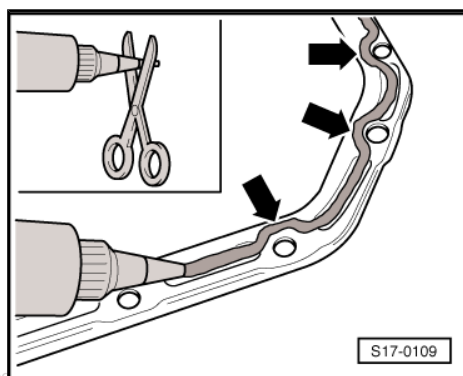
Note

- ♦ *Replace M6 oil pan bolts.*
- ♦ *Pay attention to the use by date on sealant.*
- ♦ *The oil pan must be installed within 5 minutes after applying the silicone sealant.*
- Cut off nozzle tube at the front marking (Ø of nozzle approx. 3 mm).
- Apply silicone sealant to the clean sealing surface of the oil pan, as shown in the illustration. The sealant bead must be:
 - ♦ 2 ... 3 mm thick
 - ♦ run past the area around the bolt holes on the inside -arrows-



Note

The sealant bead must not be thicker otherwise excess sealant may get into the oil pan and block the strainer in the oil suction pipe.



- Fit oil pan immediately and lightly tighten all oil pan screws.
- Tighten the screws of the oil pan to 13 Nm.
- Tighten the fixing screws of the cover plate at the gearbox to 40 Nm.

The further assembly is carried out in reverse order to disassembly.



Note

After installing the oil pan, allow the sealant to dry for about 30 minutes. Only then may engine oil be filled in.

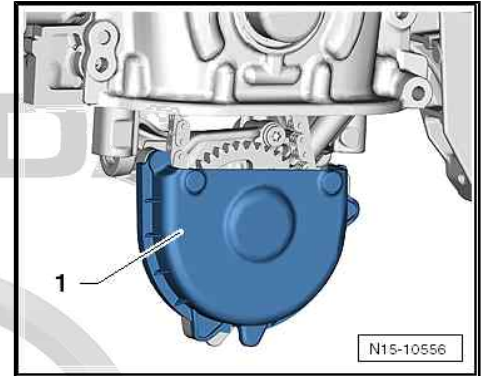
- Topping up with engine oil ➔ Maintenance ; Octavia II .



1.3 Removing and installing oil pump

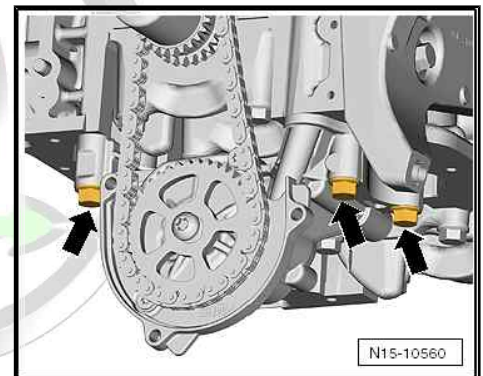
Special tools and workshop equipment required

- ◆ Catch pan , e.g. -VAS 6208-
- Removing the oil pan ➔ [page 93](#) .
- Pull off the cover -1- from the oil pump.



- Unscrew the fixing screws -arrows- of the oil pump.
- Remove the complete oil pump from the drive chain.

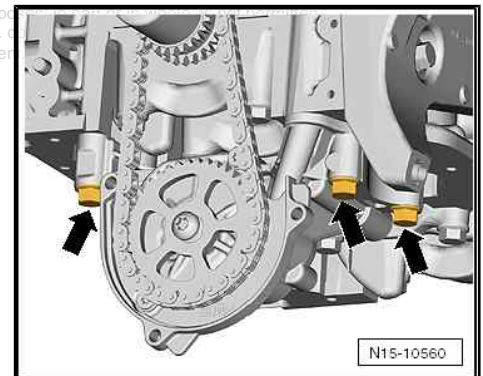
Install



- Hook the oil pump with the chain sprocket into the drive chain and tighten the new screws -arrows- to 14 Nm + torque a further 90° (1/4 turn.).

Tightening torque of the suction line: 8 Nm

- Install oil pan ➔ [page 93](#) .



1.4 Removing and installing engine oil cooler

Special tools and workshop equipment required

- ◆ Catch pan , e.g. -VAS 6208-
- ◆ Hose binding claw

Removing

- Drain the coolant from the cooling system ➔ [page 99](#) .

- Open the spring strap clamp with the hose binding claw and detach the coolant hose -1-.
- Release the four fixing screws from the engine oil cooler and remove the engine oil cooler.

Install



Note

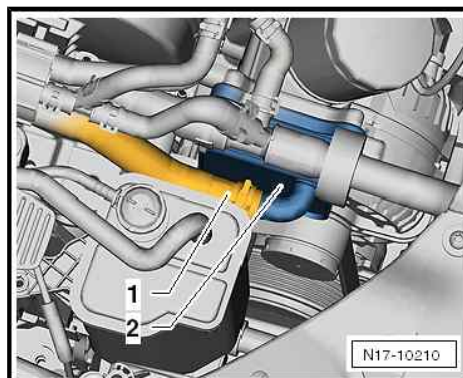
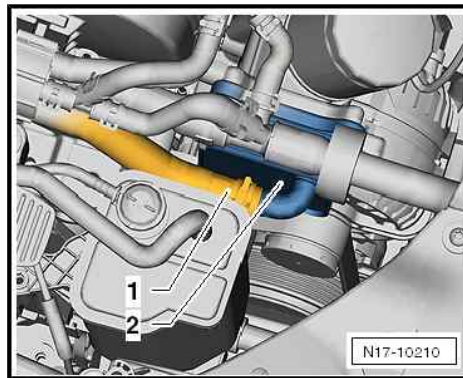
Replace gasket if damaged.

- Position the engine oil cooler -2- at the bracket and tighten the fixing screws crosswise to 8 Nm + torque a further 90° (1/4 turn).
- Place the coolant hose -1- onto the oil cooler fitting and attach it with the spring strap clip.
- Top up and bleed cooling system ➔ [page 99](#) .
- Inspect coolant level in the expansion reservoir, top up with coolant if necessary.



Note

If the engine oil cooler was replaced, the coolant must be changed.



1.5 Testing oil pressure and oil pressure switch

Special tools and workshop equipment required

- ♦ Oil pressure tester , e.g. -V.A.G 1342 -
- ♦ Voltage tester , e. g. -V.A.G 1527 B-
- ♦ Measuring tool set , e.g. -V.A.G 1594 C-
- ♦ Vehicle diagnosis, measurement and information system - VAS 5051-

Conditions

- Engine oil level o.k., test ➔ Maintenance ; Octavia II .
- Coolant temperature at least 80°C (radiator fan must have run at least once).



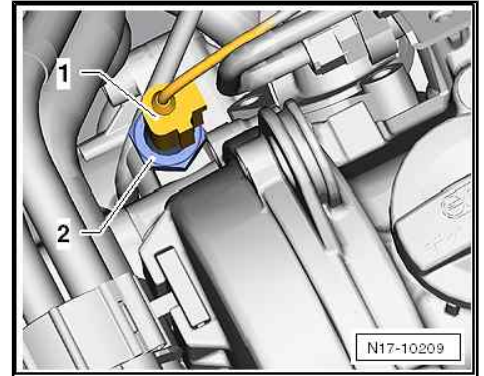
Note

Functional test and repair of the visual and acoustic oil pressure display ➔ Current flow diagrams and Fitting locations, ➔ Vehicle diagnosis, testing and information system VAS 5051.

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Test sequence

- Disconnect plug -1- and remove the oil pressure switch -2-.



- Screw oil pressure switch into the test equipment.
- Screw tester in the cylinder head instead of the oil pressure switch.
- Connect brown cable of tester to earth (-).
- Connect voltage tester to battery positive and to oil pressure switch.
- The LED must not light up.

If the LED lights up:

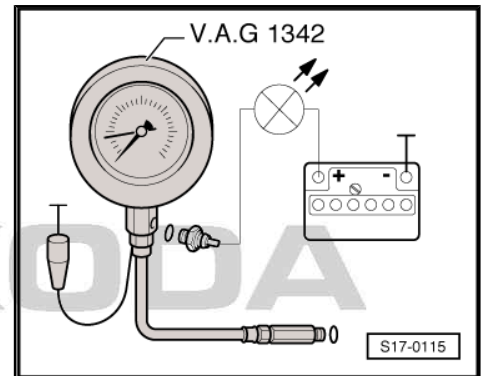
- Replace oil pressure switch -F1- .

If the LED does not light up:

- Start engine and slowly increase engine speed.
- The LED must light up at an oil overpressure of 0.03...0.07 MPa (0.3...0.7 bar), if not replace oil pressure switch.
- Increase engine speed further.
- At 2000 rpm and an oil temperature of 80°C the oil overpressure should be at least 0.2 MPa (2.0 bar).

At a higher engine speed the oil overpressure must not be greater than 0.7 MPa (7 bar).

Tightening torque of the oil pressure switch: 20 Nm



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19 – Cooling system

1 Cooling system



WARNING

Hot steam may escape when the coolant expansion reservoir is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.



Note

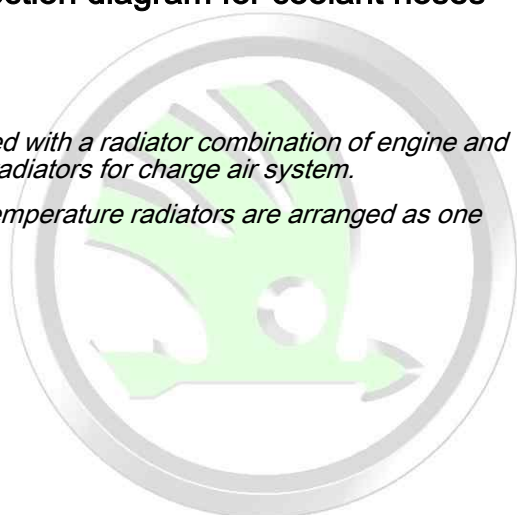
- ◆ *When the engine is warm the cooling system is under pressure. If necessary reduce pressure before repairs.*
- ◆ *The hose connections are secured with spring-type clips. In case of repair only assign the spring strap clamps via the ⇒ Electronic catalogue of original parts .*
- ◆ *Use pliers for spring strap clamps to fit the spring strap clips.*
- ◆ *Always replace seals and gasket rings.*
- ◆ *When installing fit the coolant hoses free of stress, without them touching any other components (pay attention to the marking on the coolant connection and hose).*
- ◆ *The arrows which are on the coolant pipes and the coolant hose ends must stand opposite to each other.*

1.1 Connection diagram for coolant hoses



Note

- ◆ *This engine is fitted with a radiator combination of engine and low temperature radiators for charge air system.*
- ◆ *Engine and low temperature radiators are arranged as one component part.*



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1 - Expansion reservoir

2 - Coolant recirculation pump -V50-

- ☐ removing and installing
⇒ [page 105](#)

3 - Coolant pump

- ☐ removing and installing
⇒ [page 104](#)

4 - Charge air cooler

- ☐ in the intake manifold
⇒ [page 149](#)

5 - Heat exchanger for heating

6 - Coolant regulator housing

7 - Non-return valve

- ☐ in the coolant hose, not visible from the outside

8 - Throttle valve

- ☐ in the coolant hose, not visible from the outside

9 - Radiator

- ☐ removing and installing
⇒ [page 108](#)

10 - Exhaust gas turbocharger

- ☐ removing and installing
⇒ [page 144](#)

11 - Low temperature radiator for charge air system

- ☐ Engine and low temperature radiators are arranged as one component part

12 - Cylinder head/cylinder block

- ☐ fill with fresh coolant after replacing

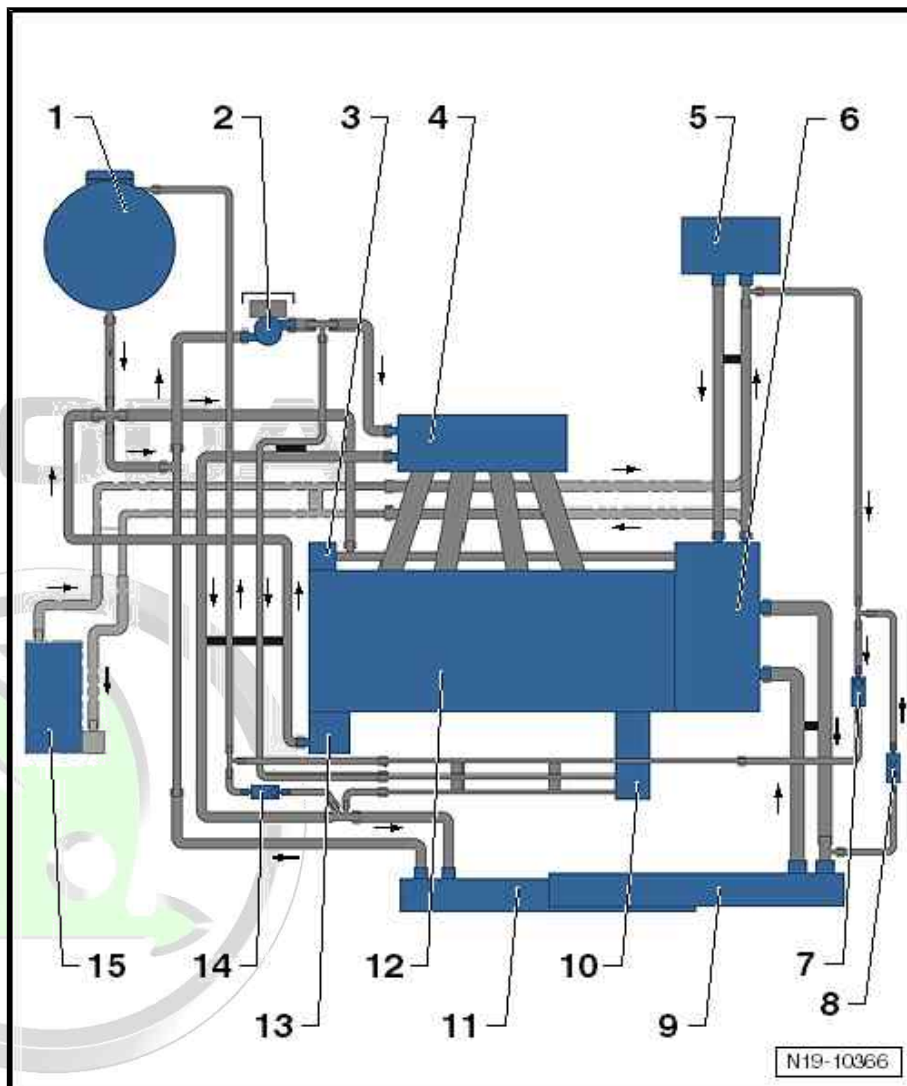
13 - Engine oil cooler

14 - Non-return valve

- ☐ in the coolant hose, not visible from the outside

15 - Auxiliary heating

- ☐ only for vehicles fitted with optional equipment:



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1.2 Draining and filling up coolant

Special tools and workshop equipment required

- ◆ Catch pan , e.g. - VAS 6208-
- ◆ Pliers for spring strap clamps
- ◆ Refractometer -T10007-

Draining



Note

- ◆ *Collect drained coolant in a clean container for reuse or proper disposal.*
- ◆ *Observe the disposal instructions.*



WARNING

Hot steam may escape when the coolant expansion reservoir is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.

- Open compensation bottle.
- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Place a catch pan - VAS 6208- under the radiator.



Note

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- ◆ *Depending on the components which must be removed ⇒ [page 98](#) , the coolant from the cooling system, from the charge air cooling system or from both cooling systems must be drained.*
- ◆ *If the coolant must be replaced, it should be drained from both cooling systems.*

Drain the coolant from the cooling system

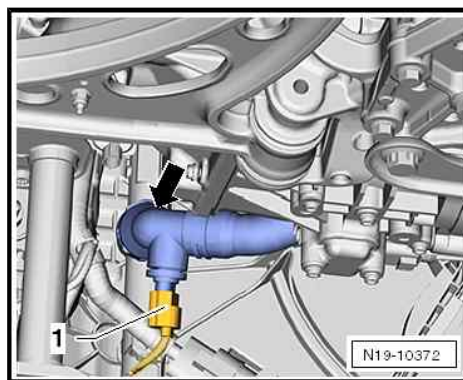
- Disconnect plug -1- from coolant temperature sender at radiator outlet -G83- .
- Open spring strap clamp -arrow- and pull off the coolant hose from the bottom radiator connection.



Note

Observe all the disposal instructions!

Drain the coolant from the charge air cooling system





- Separate the coolant hose (quick coupling) -arrow- on the bottom connection fitting of the additional radiator for coolant of charge air system.



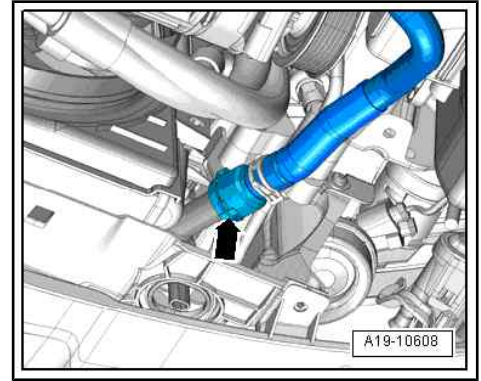
Note

Observe all the disposal instructions!

Top up and bleed cooling system.

Select the appropriate coolant additive from the ⇒ Electronic Catalogue of Original Parts or from the list of allowed coolant additives ⇒ Maintenance ; Octavia II .

- In a clean reservoir mix water with coolant in the correct ratio ⇒ Maintenance ; Octavia II .
- Reposition the removed coolant hose onto the relevant support and connect the coolant temperature sender at radiator outlet -G83 - .
- Install the noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Switch off the air-conditioning system and the heating.



Caution

In order to secure the refrigerating capacity of the charge air cooling system, the following work steps must absolutely be observed.



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- Fill up the coolant slowly up to the top marking of the criss-crossed field (max.) on the expansion reservoir.
- Seal expansion reservoir.

Vehicles without auxiliary heating.

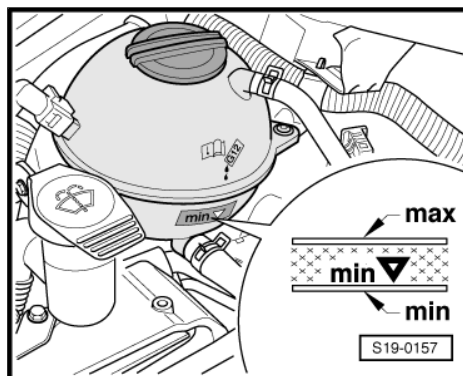
- Start the engine and maintain the engine speed for about 3 minutes at approx. 2000 r.p.m.
- Run engine until radiator fan -V7- starts.

Vehicles with auxiliary heating.



Caution

The auxiliary heating must only be switched on, if the refrigerant circuit is filled up - as described below.



- Connect diagnostic unit -VAS 5051- .
- Start the engine and maintain the engine revolutions for about 3 minutes at about 2000 r.p.m.
- On the display press consecutively the buttons for "Vehicle self-diagnosis", "18 - Auxiliary heating system" and "03 - Actuator diagnosis".
- Press the right arrow on the display so often until the coolant shut-off valve of heating system - N279- is shown.
- Perform self-diagnosis of the coolant shut-off valve of heating system -N279- and maintain the engine speed at approx. 2000 rpm for about 1 minute.

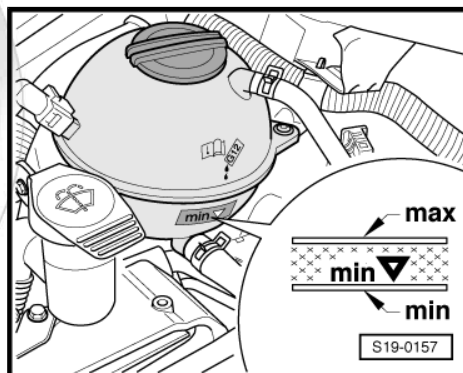
For all vehicles



WARNING

Hot steam may escape when the compensation bottle is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.

- Check the level of coolant when the expansion reservoir is closed and if necessary top up with missing coolant when the engine has cooled down.
- When engine is at operating temperature the coolant level must be at the max. marking, when engine is cold between the min. and the max. markings.

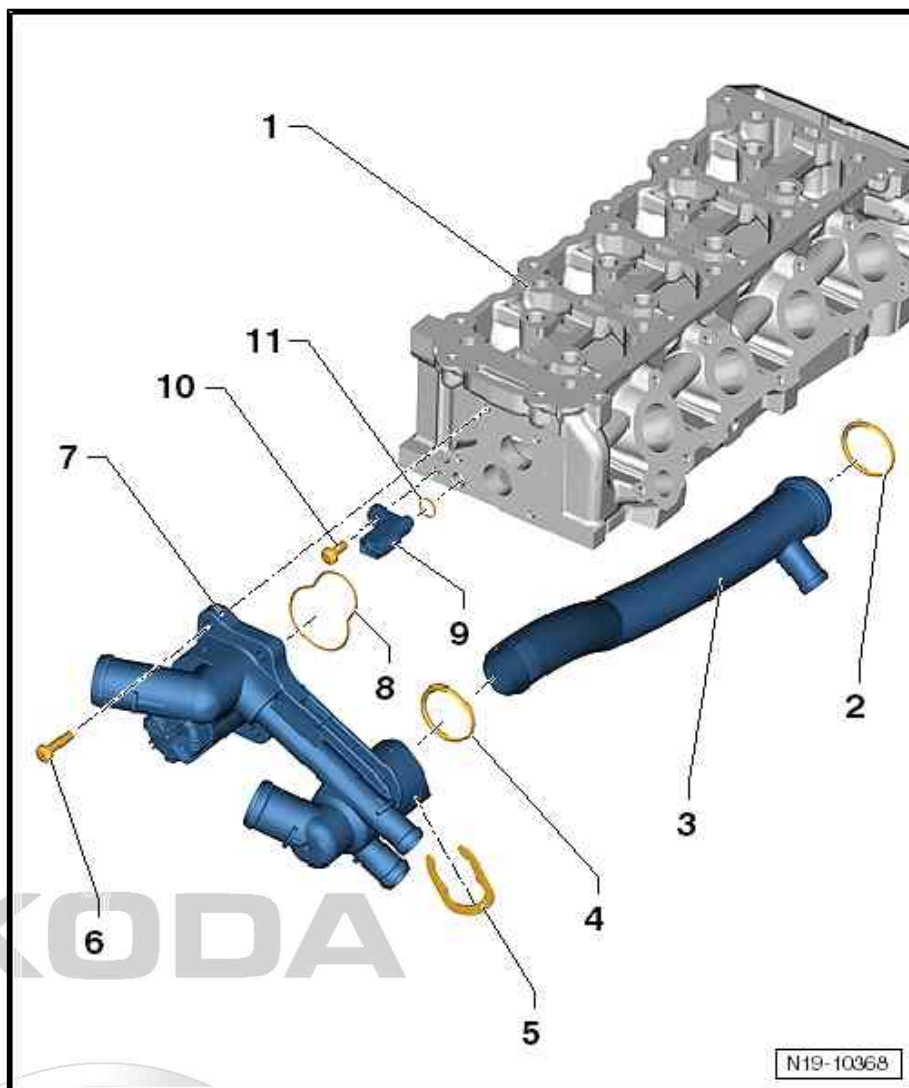


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2 Parts of cooling system engine side

2.1 Coolant regulator - Summary of components

- 1 - Cylinder head
- 2 - O-ring
☐ replace
- 3 - Coolant pipe
- 4 - O-ring
☐ replace
- 5 - Retaining clip for coolant pipe
- 6 - 11 Nm
- 7 - Coolant regulator housing
- 8 - Gasket
☐ replace
- 9 - Coolant temperature sender -G62-
☐ before removing, reduce pressure in cooling system if necessary
- 10 - 10 Nm
- 11 - O-ring
☐ replace



2.2 Removing and installing belt pulley for coolant pump

Special tools and workshop equipment required

- ◆ Water pump wrench -MP 1-308 (V.A.G 1590) -

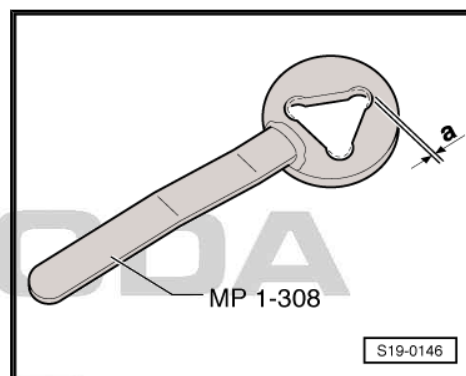
Modify water pump wrench -MP 1-308-

- Because of modified fixing screws for the belt pulley of the coolant pump, these 3 curvatures must be filed open.

-a- at least 1 mm

Removing

- Remove V-ribbed belt ➔ [page 26](#) .

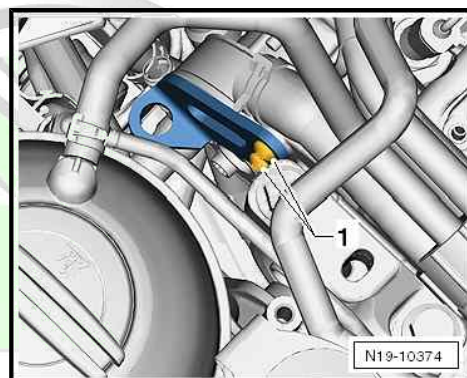


- Release screws -arrows- and remove holder from timing case.



Note

The bracket at the timing case only serves as transport security of the engine before the first installation and must not be refitted.

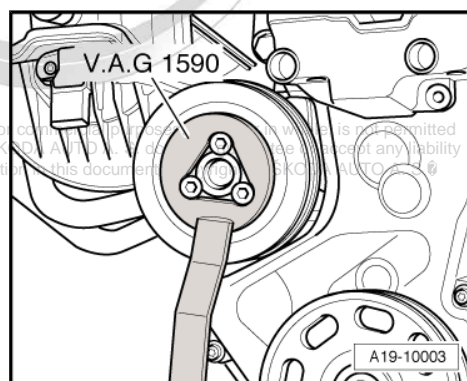


- Release the screws for the belt pulley for coolant pump, to do so counterhold with water pump wrench -V.A.G 1590- .

Install

Installation is performed in the reverse order, pay attention to the following points:

- ♦ Tightening torque: 20 Nm



2.3 Removing and installing coolant pump

Special tools and workshop equipment required

- ♦ Catch pan , e.g. -VAS 6208-

Removing



Note

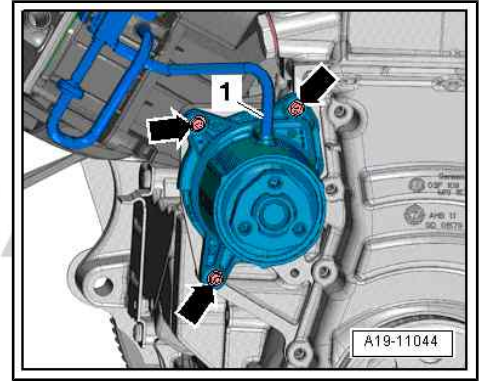
- ♦ *The integrated gasket of the coolant pump must not be separated from the coolant pump.*
- ♦ *If damage and leak present, replace coolant pump with gasket completely.*
- Drain the coolant from the cooling system ➔ [page 99](#) .
- Remove belt pulley for control pump ➔ [page 103](#) .

- Disconnect the vacuum line -1- of the solenoid valve for coolant circuit -N492- from the coolant pump.
- Release screws -arrows- and remove coolant pump.

Install

Installation is performed in the reverse order, pay attention to the following points:

- ◆ Tightening torque: 9 Nm
- Install belt pulley for coolant pump ⇒ [page 103](#) .
- Top up and bleed cooling system ⇒ [page 99](#) .



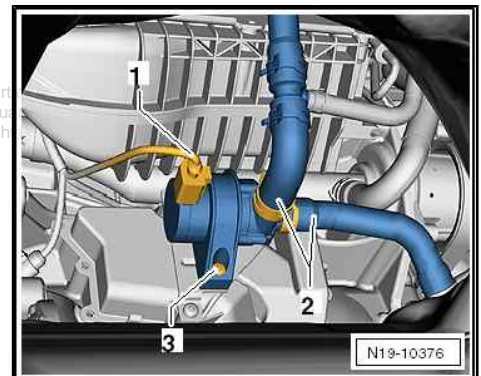
2.4 Removing and installing coolant recirculation pump -V50-

Special tools and workshop equipment required

- ◆ Hose clamps up to Ø 25 mm -MP7-602 (3094) -
- ◆ Pliers for spring strap clamps
- ◆ Catch pan , e.g. -VAS 6208-

Removing

- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Unplug connector -1-.
- Release screw -3- and remove coolant recirculation pump -V50- from bracket.
- Place a catch pan -VAS 6208- under the engine.
- Disconnect coolant hoses -2- with hose clamps -MP7-601- and detach from the pump -V50- .



Install

- ◆ Tightening torque: 8 Nm.

Installation is performed in the reverse order, pay attention to the following points:

- Inspect coolant level, if necessary top up cooling system and bleed ⇒ [page 99](#) .

3 Radiator and radiator fan

3.1 Parts of cooling system on the side next to the body - Summary of components



Note

- ◆ This engine is fitted with a radiator combination of engine and low temperature radiators for charge air system.
- ◆ Engine and low temperature radiators are arranged as one component part.

1 - Radiator with low temperature radiator for charge air system

- ☐ removing and installing ➔ [page 108](#)
- ☐ after replacing fill entire system with fresh coolant

2 - Coolant hose

- ☐ to exhaust gas turbo-charger

3 - Coolant hose

- ☐ to low temperature radiator for charge air system

4 - Coolant hose

- ☐ to exhaust gas turbo-charger

5 - Coolant hose

- ☐ to charge-air cooler in the intake manifold

6 - Radiator fan -V7-

- ☐ with radiator fan control unit -J293-
- ☐ removing and installing ➔ [page 107](#)

7 - Coolant hose

- ☐ to coolant pipe below the intake manifold

8 - Coolant hose

- ☐ to engine oil cooler

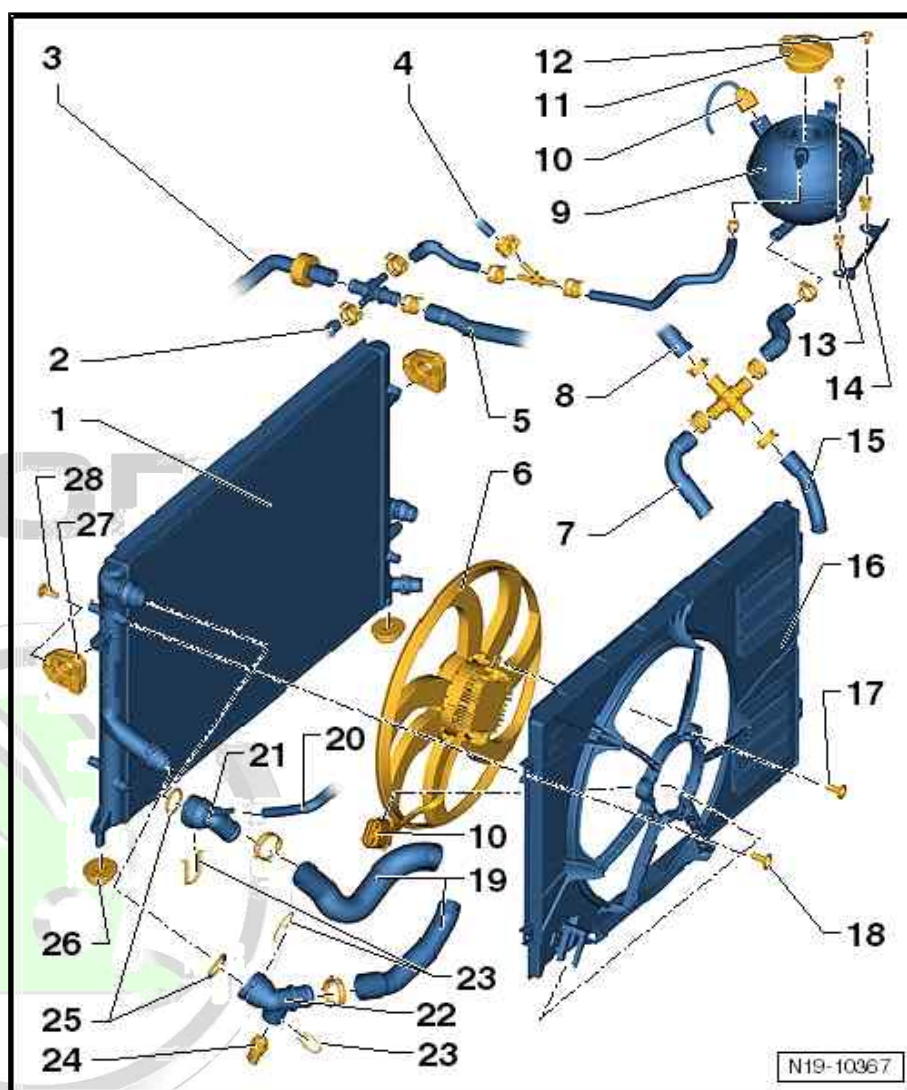
9 - Expansion reservoir

- ☐ with coolant shortage warning light sender -G32-
- ☐ Check the cooling system for tightness ➔ [page 109](#)

10 - Connector

11 - Screw cap

- ☐ Testing the pressure relief valve in the cap ➔ [page 109](#)



12 - 5 Nm

13 - Plastic inserts

- ☐ for fixing screws

14 - Support

15 - Coolant hose

- ☐ at coolant recirculation pump -V50-

16 - Fan shroud

- ☐ removing and installing ⇒ [page 107](#)

17 - 5 Nm

18 - 5 Nm

19 - Coolant hose

- ☐ at coolant regulator housing

20 - Coolant hose

- ☐ to heat exchanger for heating

21 - Connection fittings

- ☐ for top coolant hose

22 - Connection fittings

- ☐ for bottom coolant hose

23 - Retaining clip

- ☐ check tightness

24 - Coolant temperature sender at radiator outlet -G83-

25 - O-ring

- ☐ replace if damaged

26 - Bottom radiator bearing

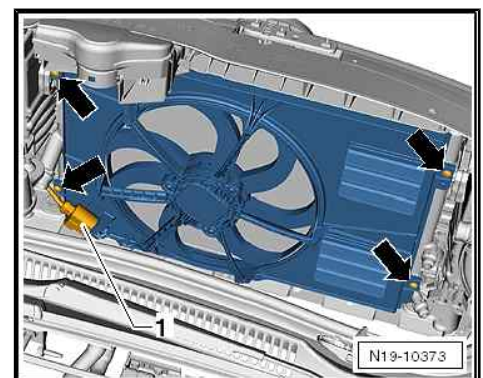
27 - Top radiator bearing

28 - 5 Nm

3.2 Removing and installing fan shroud for radiator fan -V7-

Removing

- Remove air filter ⇒ [page 161](#) .
- Unscrew the top fixing screws of the fan shroud -arrows-.
- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Disconnect the plug connection -1- and unscrew the bottom fixing screws of the fan shroud -arrows-.
- Take out fan shroud downwards.



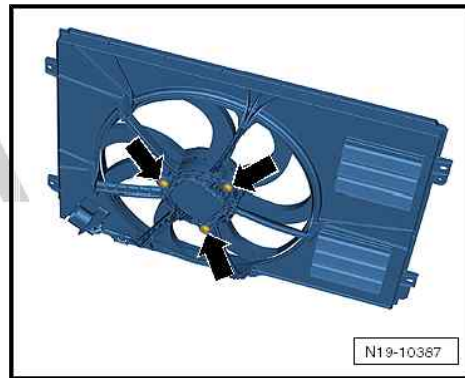
- Release screws -arrows- and remove radiator fan -V7 - .

Install

Installation is performed in the reverse order, pay attention to the following points:

Tightening torques:

Component	Nm
Radiator fan at fan shroud	5
Fan shroud at radiator	5



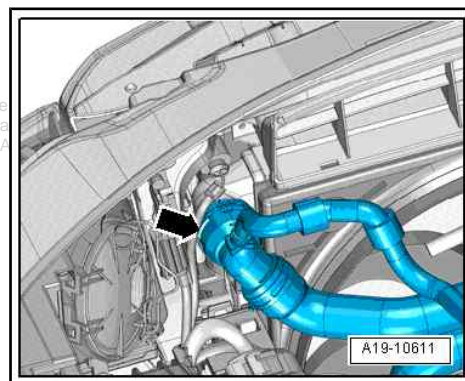
3.3 Removing and installing radiator

Special tools and workshop equipment required

- ♦ Catch pan , e.g. - VAS 6208-
- ♦ Pliers for spring strap clamps

Removing

- Drain coolant ⇒ [page 99](#) .
- Removing fan shroud ⇒ [page 107](#) .
- Remove top left coolant fitting from radiator, to do so raise the retaining clip -arrow-.
- Detach the connection fitting of the top right coolant hose for the low temperature radiator.
- Remove front bumper ⇒ Body Work ⇒ Rep. Gr. 63 .
- Remove headlights ⇒ Electrical System ⇒ Rep. Gr. 94 .



Vehicles with air conditioning

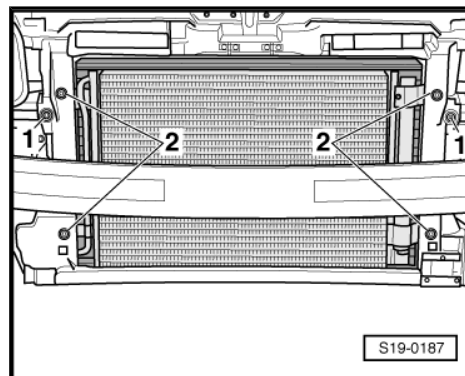


WARNING

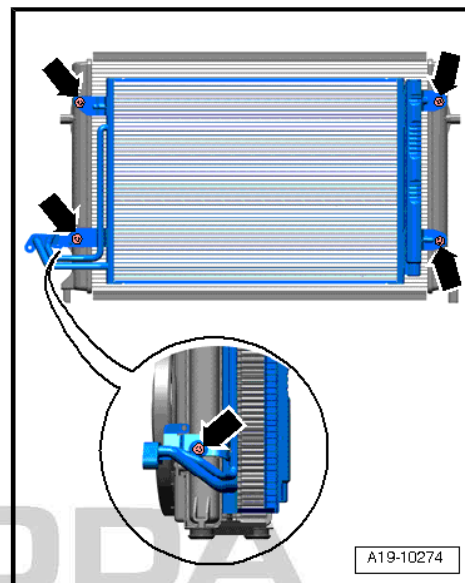
Do not open the refrigerant circuit of the air conditioning system.

In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

- Screw out the fixing screws -2- of the condenser.



- Release the securing bolts -arrows- of the condenser.



Continued for all vehicles

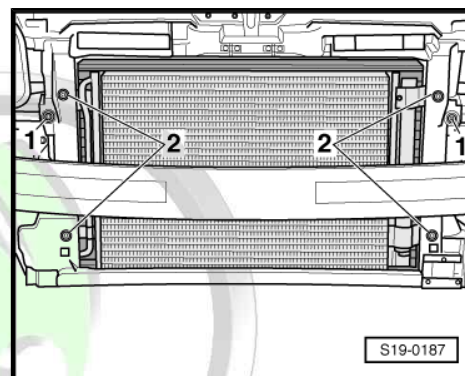
- Release screws -1- at radiator.
- Swivel the radiator slightly backwards.
- Unhook radiator upwards and remove downwards.

Install

Installation is performed in the reverse order, pay attention to the following points:

- Top up and bleed cooling system ➔ [page 99](#).

Tightening torques: ➔ [page 106](#)



3.4 Checking the coolant system for leak-tightness

Special tools and workshop equipment required

- ◆ Cooling system testing device , e.g. -V.A.G 1274-
- ◆ Adapter for cooling system testing device , e.g. -V.A.G 1274/8-
- ◆ Adapter for cooling system testing device , e.g. -V.A.G 1274/9-

Test condition

- Engine must be warm.

Test sequence



WARNING

Hot steam may escape when the coolant expansion reservoir is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.

- Open compensation bottle.



- Position the cooling system testing device -V.A.G 1274- with adapter -V.A.G 1274/8 - on the coolant expansion reservoir.
- Using the hand pump of the testing device generate an over-pressure of approx. 0.1 MPa (1.0 bar).

If the pressure drops:

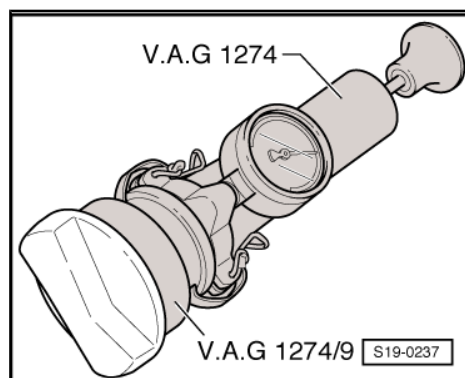
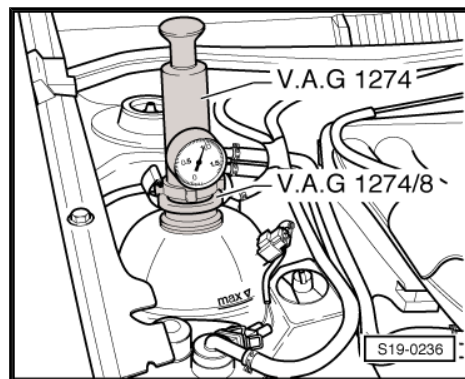
- Determine position of the leak and repair fault.

Testing the pressure relief valve in the cap

- Position the cooling system testing device -V.A.G 1274- with adapter -V.A.G 1274/9 - on the cap.
- Operate the handpump.
- The pressure relief valve should open at a pressure of 0.14...0.16 MPa (1.4...1.6 bar).

If the pressure relief valve does not open:

- Replace cap.



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20 – Fuel Supply

1 Fuel tank and fuel delivery unit

Note

- ◆ *Fuel hoses at the engine must only be secured with spring-type clips ⇒ electronic catalogue of original parts .*
- ◆ *Use pliers for spring strap clamps to fit the spring strap clips.*

1.1 Fuel tank - Summary of components

1 - Mounting part

2 - Screw cap

- ☐ replace if damaged

3 - Earth connection

- ☐ check for firm seating

4 - 11 Nm

5 - Wiring

6 - 25 Nm

- ☐ replace

7 - Fuel tank

- ☐ removing and installing
⇒ [page 115](#)

8 - Circlip

9 - Bracket for the exhaust system

10 - Support strap

- ☐ Check fitting position

11 - Cover plate

12 - Feed line

- ☐ to fuel rail
- ☐ check for firm seating

13 - Fuel filter

- ☐ removing and installing
⇒ [page 113](#)

14 - Vent line

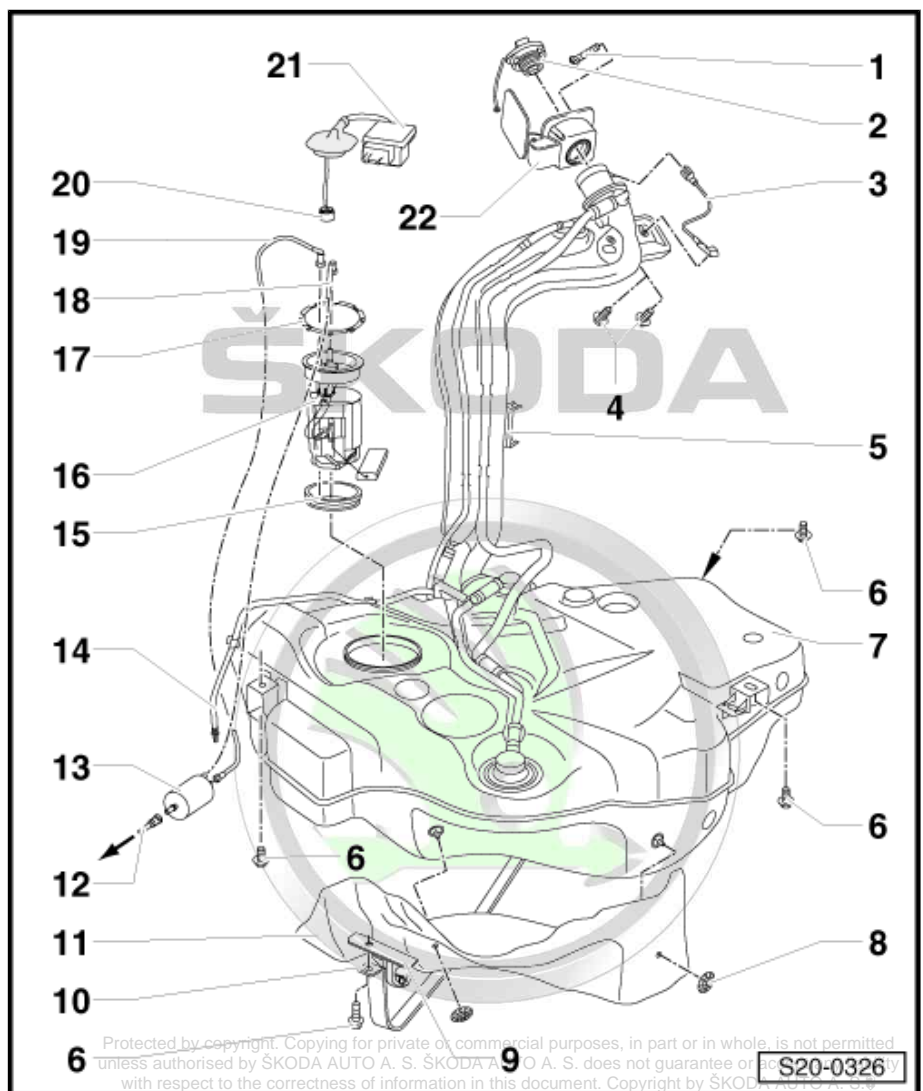
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

15 - Sealing ring

- ☐ replace
- ☐ to be inserted dry into the opening of the fuel tank
- ☐ only moisten the inner seal of the flange with fuel for fitting purposes

16 - Fuel delivery unit

- ☐ removing and installing ⇒ [page 117](#)





- ☐ inspecting fuel pump ⇒ [page 120](#)
- ☐ note the installed position of the fuel tank ⇒ [page 112](#)
- ☐ with sender for fuel gauge display -G -
- ☐ Removing and installing the sender for fuel gauge display -G- ⇒ [page 119](#)
- ☐ Clean strainer if dirty

17 - Lock ring, 110 Nm

- ☐ check for firm seating
- ☐ use wrench -T30101 (3087)- for removing and installing

18 - Feed line

- ☐ black
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

19 - Return-flow line

- ☐ blue
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

20 - Fuel pump control unit -J538 -

- ☐ after replacing, adapt the engine control unit -J623 - to the fuel pump control unit -J538- ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ☐ check ⇒ Vehicle diagnosis, testing and information system VAS 5051

21 - Fuel tank lid unit

- ☐ with rubber bowl
- ☐ removing and installing ⇒ Body Work ⇒ Rep. Gr. 55

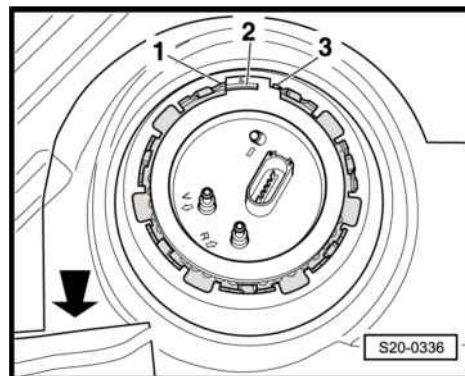
Fitting location of the fuel delivery unit

The peg -2- on the fuel delivery unit must be between the pegs -1- and -3-.



Note

- ◆ -Arrow- points in direction of travel.
- ◆ The fuel delivery unit can only be installed in this position.





1.2 Fuel filter - Summary of components

1 - Fuel filter

- ☐ with installed pressure limiting valve for fuel re-turn-flow line

Opening pressure:
0.60...0.68 MPa (6.0...
6.8 bar)

- ☐ do not interchange connections
- ☐ Fitting position
⇒ [page 113](#)

2 - Fuel feed line

- ☐ black
- ☐ from fuel tank
- ☐ press in securing ring in order to unlock

3 - Fuel return-flow line

- ☐ blue
- ☐ to fuel tank
- ☐ press in securing ring in order to unlock

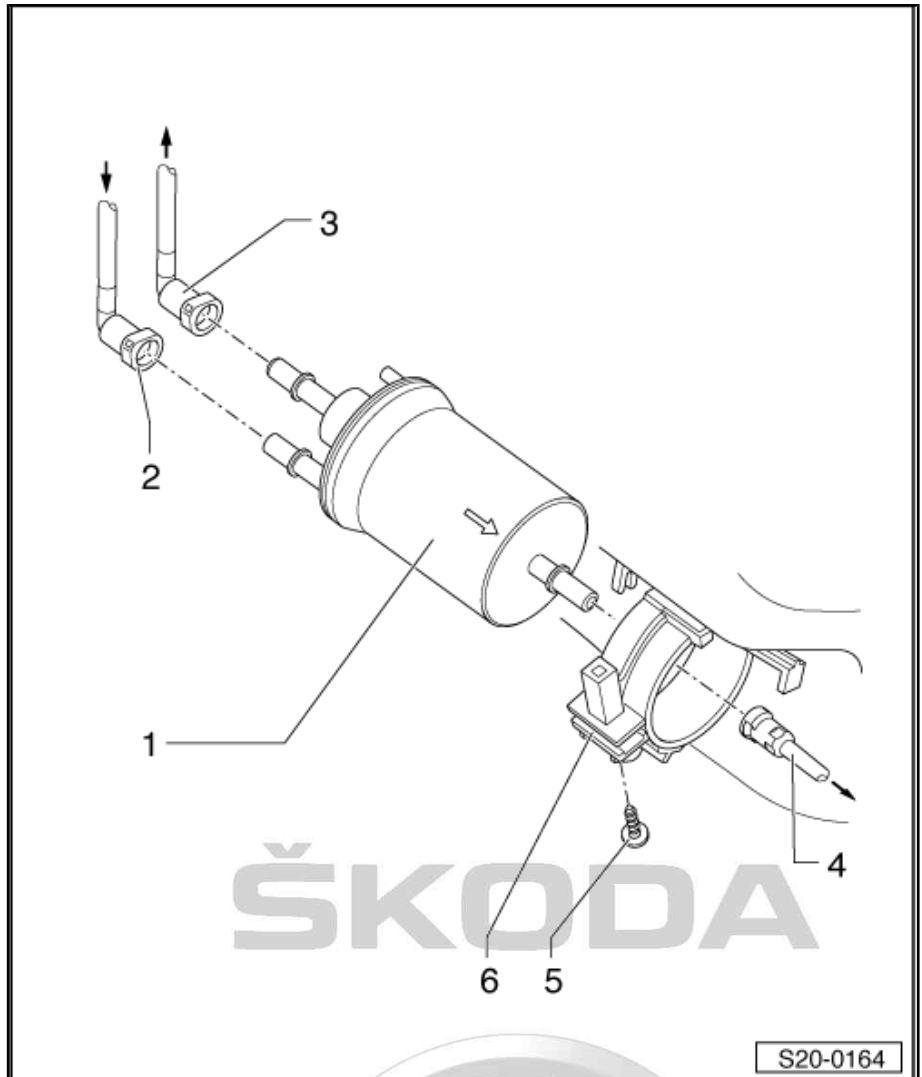
4 - Fuel feed line

- ☐ black
- ☐ to the engine
- ☐ press in securing ring in order to unlock

5 - 3 Nm

6 - Support

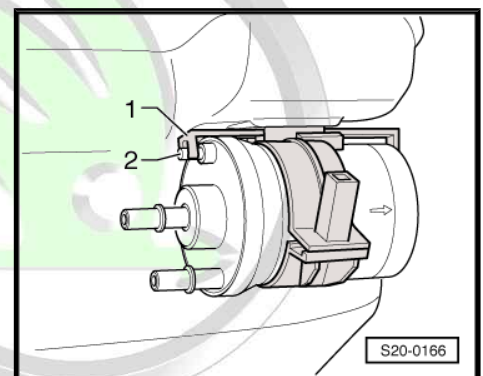
- ☐ for fuel filter
- ☐ attached to the fuel tank



Fitting position of the fuel filter

The pin -2- at the filter housing must engage in the recess -1- of the bracket.

The direction of flow is marked by arrows.



1.3 Extract fuel from the fuel tank

Special tools and workshop equipment required

- ◆ Hose adapter , e.g. -V.A.G 1318 -16 -
- ◆ Adapter , e.g. -V.A.G 1318 -17-
- ◆ Measuring tool set , e.g. -V.A.G 1594 C-



- ◆ Battery
- ◆ Catch pan for fuel



Note

If there are functional problems of the fuel delivery unit suction off fuel with fuel extraction device, e.g. -VAS 5190-.

Work procedure



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work ⇒ Rep. Gr. 72.
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

Vehicles with auxiliary heating.

- Unplug the 2-pin plug of the dosing pump -V54-.

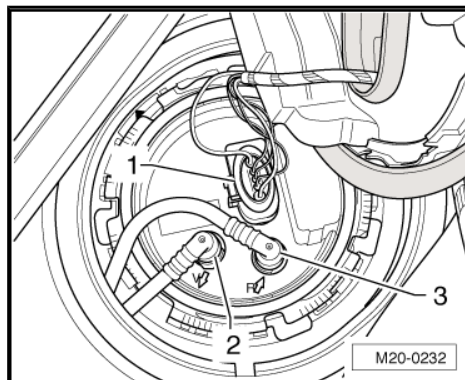
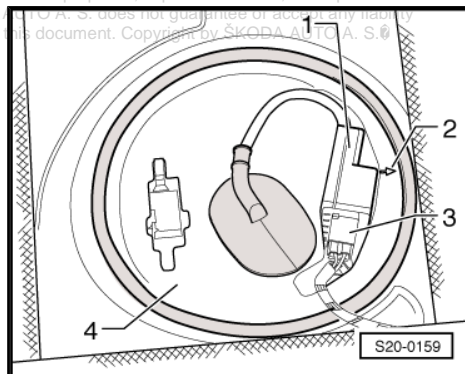
Continued for all vehicles

- Unplug the 5-pin plug -1- from the black feed line -2-.



Note

Press in the securing ring in order to unlock the line.



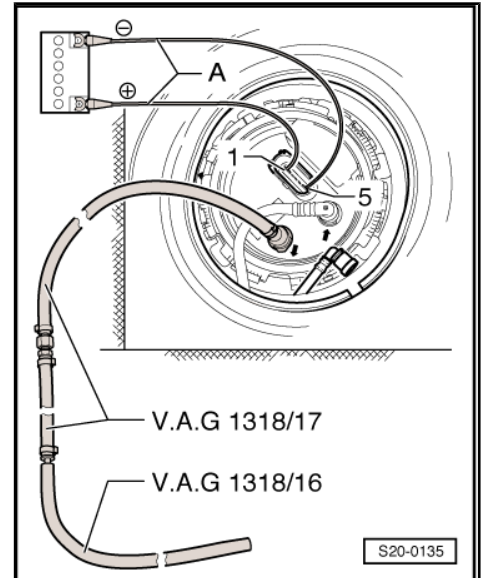
- Connect the adapter -V.A.G 1318/16- with the adapter - V.A.G 1318/17- and fit this "drain pipe" thus prepared onto the feed support of the fuel delivery unit.
- Hold the "drain pipe" in a suitable fuel tank.
- Connect the battery and the contacts of the fuel pump with adapter cables -A- from the adapter cable set -V.A.G 1594/C- as follows:
 Battery positive (+) to contact -1- of the fuel pump
 Battery minus (-) to contact -5- of the fuel pump

The fuel pump runs and suctions off fuel.



WARNING

In order to prevent an overflow of fuel in case of a too small fuel tank, the fuel pump must not run unattended.



1.4 Removing and installing the fuel tank

Special tools and workshop equipment required

- ◆ Engine/gearbox jack , e.g. - V.A.G 1383 A-

Removing

- The fuel tank must be empty for weight reasons when removing it, if necessary suction the fuel out of the fuel tank
 ⇒ [page 113](#) .



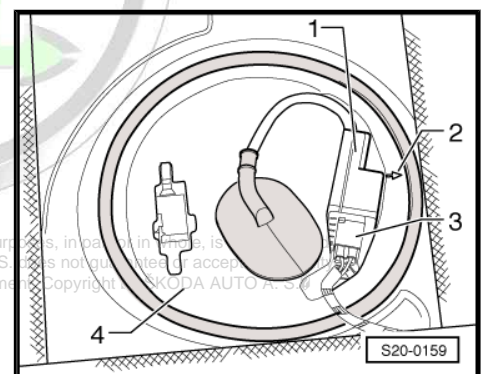
Note

- ◆ *Safety precautions when working on the fuel supply system*
 ⇒ [page 3](#) .
- ◆ *Rules of cleanliness when working on the fuel supply system*
 ⇒ [page 5](#) .
- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work ⇒ Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

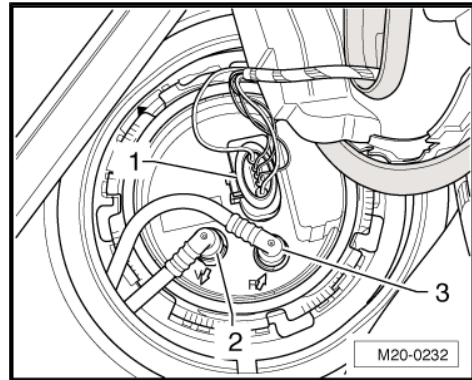


Note

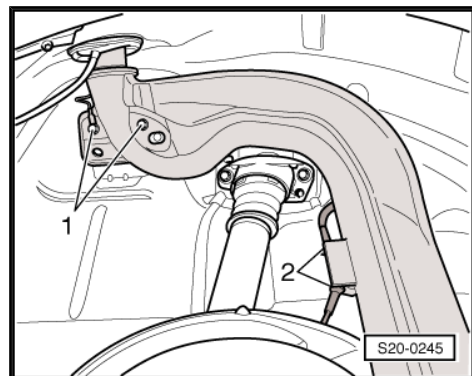
For vehicles with auxiliary heating, the plug connection for the dosing pump -V54- must also be disconnected.



- Unplug the 5-pin plug -1- from the fuel pump.
- Clean around the fuel filler neck.
- Unscrew right rear wheel.
- Remove the rear right wheelhouse liner ⇒ Body Work ⇒ Rep. Gr. 66 .



- Unscrew screws -1- for filler neck on the body.
- Unclip the electrical cable from the bracket -2- at the top and bottom of the filler neck.



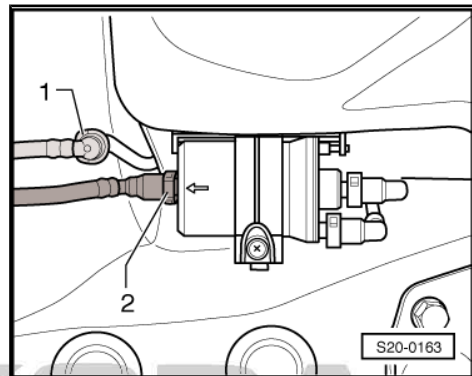
- Disconnect vent line -1- (white) and fuel feed line -2- (black) at the connection point.



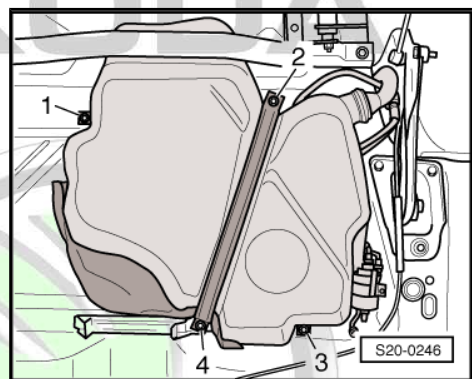
Note

- ♦ For vehicles with auxiliary heating, the fuel line of the dosing pump -V54- must also be disconnected.
- ♦ Press in the securing ring in order to unlock the line.

- Remove middle silencer ⇒ [page 180](#) .



- Release fixing screws -2- and -4- and remove the tensioning strap.
- Support fuel tank using the engine/gearbox jack -V.A.G 1383 A- .
- Release fixing screws -1- and -3-.
- Slightly lower the fuel tank.



Note

The filler neck must be "extracted" between structure and rear axle. Lift down the fuel tank with a 2nd mechanic from engine/gearbox jack -V.A.G 1383 A- .

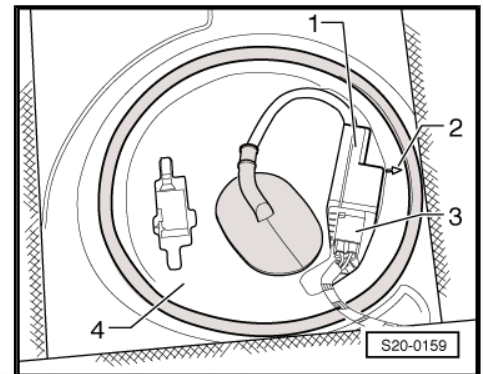
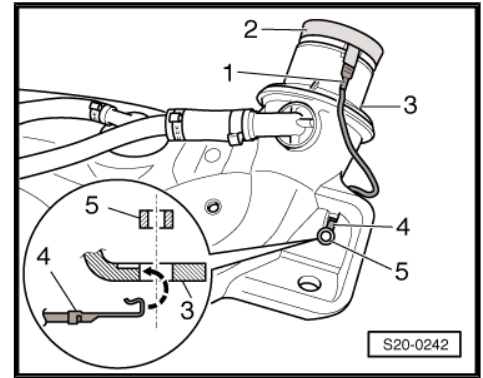
Install

- Check if the earth lead shows traces of oxidation on both connections, remove if necessary.

- Check fitting position of the earth lead -1-.
- The plug -1- on the metal plate ring -2- must be placed on firmly.
- The contact tab -4- must be hung in the fuel tank -3- and secured with the spacer bush -5-.
- Guide the filler neck between rear axle and structure with the assistance of a 2nd mechanic. Then position the fuel tank onto the engine/gearbox jack -V.A.G 1383 A- .

Further installation occurs in reverse order. Pay attention to the following:

- ◆ Lay the vent and fuel lines without any kinks.
- ◆ Do not mix-up the feed line and the return-flow line (the return-flow line is blue, the feed line is black).
- ◆ Make sure the line connections fit tightly.
- ◆ Check earth connection of fuel tank/body at filler neck.
- ◆ After installing the fuel tank, check whether the lines are also clipped in place on the fuel tank.
- Clip on cover -4- with fuel pump control unit -J538- -1-.
- The arrow -2- on the cover points in direction of travel.



1.5 Removing and installing fuel delivery unit

Special tools and workshop equipment required

- ◆ Key -T30101 (3087)-

Removing

- The fuel tank must not be more than $\frac{3}{4}$ full.



Note

- ◆ *If necessary, extract fuel from the fuel tank ➔ [page 113](#) .*
- ◆ *Observe the safety instructions before starting fitting work ➔ [page 3](#) .*
- ◆ *Observe rules for cleanliness ➔ [page 5](#) .*
- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ➔ Body Work ➔ Rep. Gr. 72 .

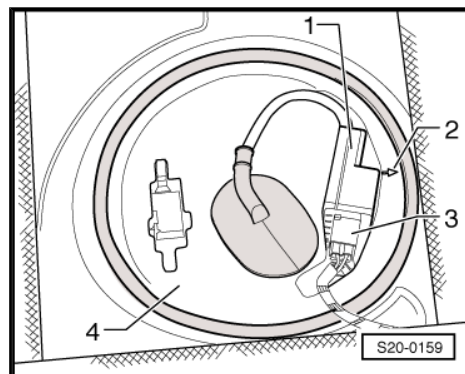
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- Unclip the cover -4- with the fuel pump control unit -J538- -1-.



Note

For vehicles with auxiliary heating, the plug connection for the dosing pump -V54- must be disconnected additionally.

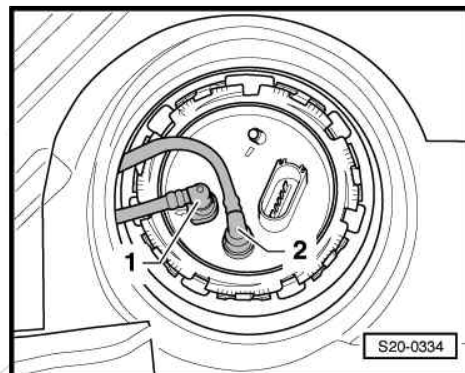


- Unplug the 5-pin plug, the black feed line -1- and the blue return-flow line -2-.



Note

- ◆ Press in the securing ring in order to unlock the line.
- ◆ On vehicles with auxiliary heating the suction line for the dosing pump -V54- must be pulled out additionally (open lower clamp).

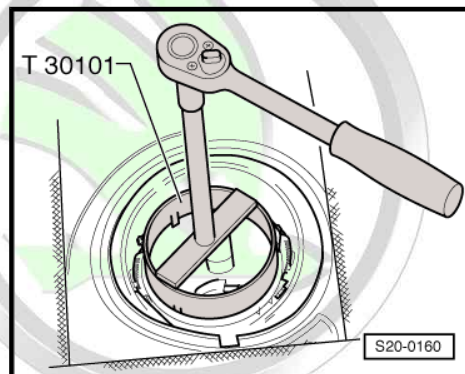


- Open lock ring with the wrench -T30101- .



Note

- ◆ Take the fuel delivery unit out of the fuel tank in such a way that the electrical cables and the fuel hoses are not damaged and that the float arm of the sender for the fuel gauge display -G- is not bent.
- ◆ You must empty the old delivery unit before disposing of it if you wish to replace the fuel delivery unit.



- Pull the fuel delivery unit out of the opening of the fuel tank.

Install

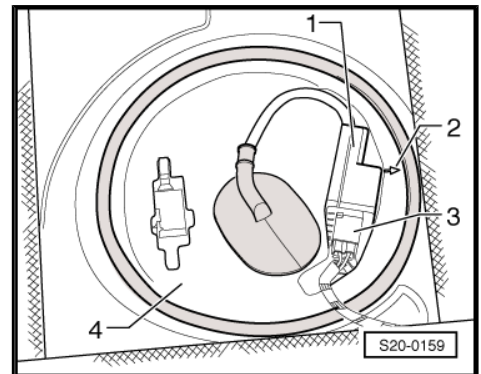
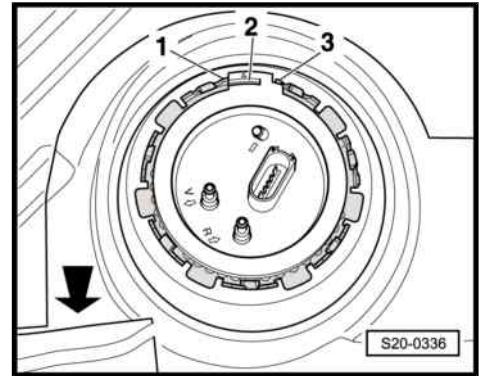
Installation occurs in reverse order. Pay attention to the following:

- Insert the new dry gasket ring of the flange into the opening of the fuel tank and only moisten the inside with fuel.
- Insert the fuel delivery unit into the fuel tank in such a way that the float arm of the sender for the fuel gauge display -G- is not bent.
- Press the closing flange downwards, install the lock ring and connect the fuel lines.

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i Note

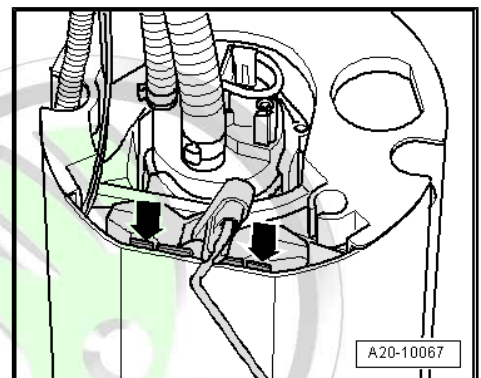
- ◆ Pay attention to installed position of flange of fuel delivery unit:
The peg -2- on the fuel delivery unit must be between the pegs -1- and -3-. -Arrow- points in direction of travel.
 - ◆ Tighten the lock ring to 110 Nm.
 - ◆ Do not interchange the black feed line with the blue return-flow line (arrows on the flange of the fuel delivery unit).
 - ◆ Make sure the line connections and the 5-pin plug fit tightly.
 - ◆ After installing the fuel delivery unit, check whether the feed and return-flow lines are also clipped on the fuel tank.
- Clip on cover -4- with fuel pump control unit -J538- -1-.
 - The arrow -2- on the cover points in direction of travel.



1.6 Removing and installing the sender for fuel gauge display -G-

Removing

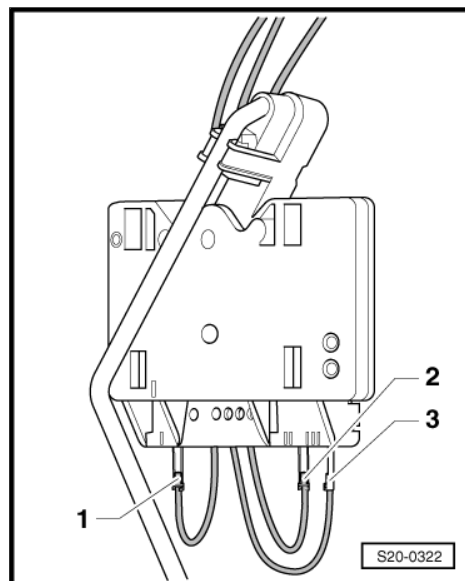
- Remove fuel delivery unit ➔ [page 117](#) .
- Unlock the catches -arrows- using a screwdriver and pull out the sender for fuel gauge display - G- towards the top.



- Unlatch and disconnect the plug connection of the lines -1- (brown), -2- (blue) and -3- (black).

Install

- Connect the lines and check the connector for secure catch.
- Insert the sender for fuel gauge display -G- in the guides at the fuel delivery unit and press downwards until it latches into position.
- Install fuel delivery unit ➔ [page 117](#) .



1.7 Testing fuel pump

Special tools and workshop equipment required

- ◆ Key -T30101 (3087)-
- ◆ Pressure gauge , e.g. -V.A.G 1318- or pressure gauge , e.g. -VAS 6550-
- ◆ Adapter , e.g. -V.A.G 1318/11-
- ◆ Hose adapter , e.g. -V.A.G 1318/16 -
- ◆ Adapter set , e.g. - V.A.G 1318/17A -
- ◆ Double connection piece , e.g. - V.A.G 1318/23 -
- ◆ Remote control , e.g. -V.A.G 1348/3A - with adapter cable , e.g. -V.A.G 1348/3-3 -
- ◆ Voltage tester , e. g. -V.A.G 1527 B-
- ◆ Measuring tool set , e.g. -V.A.G 1594 C-
- ◆ Multimeter , e.g. -V.A.G 1715 -
- ◆ Adapter for measuring method/DSO (5-pin) , e.g. -VAS 5565-
- ◆ Vehicle diagnosis, measurement and information system - VAS 505X-
- ◆ Measuring vessel



Note

- ◆ *The adapter set -V.A.G 1318/17A- replaces the adapter set -V.A.G 1318/17- .*
- ◆ *The figures shown in the descriptions were not changed for this reason.*

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Inspect proper operation and power supply ⇒ [page 121](#)

Check fuel pressure with pressure gauge -V.A.G 1318-
⇒ [page 122](#)

Check fuel pressure with pressure gauge -VAS 6550-
⇒ [page 123](#)

Check holding pressure with pressure gauge - V.A.G 1318 -
⇒ [page 125](#)

Check holding pressure with pressure gauge - VAS 6550-
⇒ [page 127](#)

Check fuel flow rate with pressure gauge -V.A.G 1318 -
⇒ [page 128](#)

Check fuel flow rate with pressure gauge -VAS 6550-
⇒ [page 131](#)

Check power consumption ⇒ [page 134](#)

1.7.1 Inspecting proper operation and power supply

Test conditions

- Battery voltage at least 11.5 V.
- Fuel pump fuse O.K. ⇒ Current flow diagrams and Fitting locations.
- Fuel pump control unit -J538- O.K.

Test sequence



Note

The function of the fuel pump is tested with the actuator diagnosis.

- Connect vehicle diagnosis, measurement and information system -VAS 5051- .
- Switch on ignition.
- On the display press consecutively the buttons for “Vehicle self-diagnosis”, “01 - Engine electronics” and “03 - Actuator diagnosis”.
- On the display press the right arrow button up to the actuator diagnosis of the fuel pump electronics.
- The fuel pump must now run slowly to the maximum speed.



Note

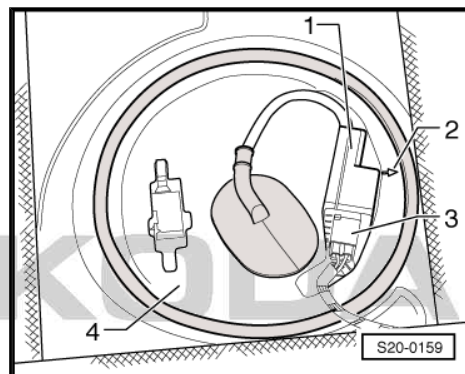
The fuel pump runs very quietly.

- Switch off ignition.

The fuel pump does not run:

- Removing rear seat bench ⇒ Body Work ⇒ Rep. Gr. 72 .

- Disconnect plug -3- from fuel pump control unit -J538- .



- Testing the voltage supply with the voltage tester -V.A.G 1527B- between contact -1- and -6-.

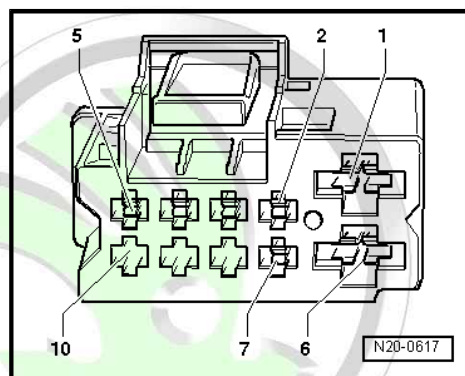
- The LED must light up.

The LED does not light up:

- Determine and remove open circuit in the wiring according to the current flow diagram ➔ Current flow diagrams and Fitting locations.

The LED lights up (power supply O.K.):

- Remove fuel delivery unit ➔ [page 117](#) .
- Check whether the electric wiring between the flange and fuel pump is connected.



If there is no open circuit in the wiring:

- Fuel pump defective, replace the fuel delivery unit ➔ [page 117](#) .

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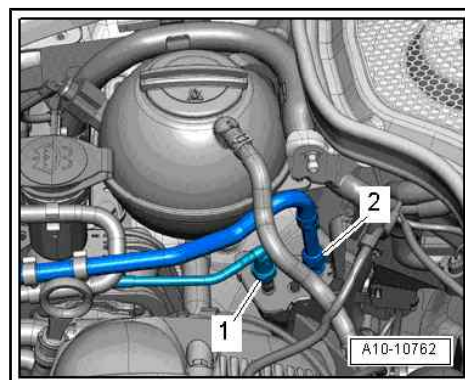
1.7.2 Check fuel pressure with pressure gauge -V.A.G 1318 -

- The function of the fuel pump was checked ➔ [page 121](#) .



Note

- ♦ *Safety precautions when working on the fuel supply system* ➔ [page 3](#) .
- ♦ *Rules of cleanliness when working on the fuel supply system* ➔ [page 5](#) .
- Remove the fuel feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



- Install the pressure gauge -V.A.G 1318- with the adapter set -V.A.G 1318/17A- instead of the fuel feed line.
- Open shut-off cock of the pressure gauge. The lever then points in position -A-.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4...0.7 MPa (4...7.0 bar)

If fuel line is o.k.:

- Test holding pressure ➔ [page 125](#) .

If the specified pressure is exceeded:

- Check the return line between the fuel filter and fuel pump for kinks and blockages.

If no fault is found:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.

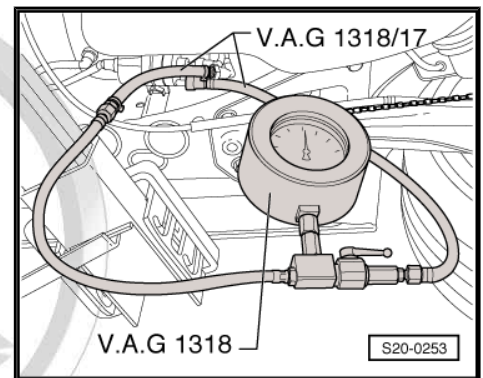
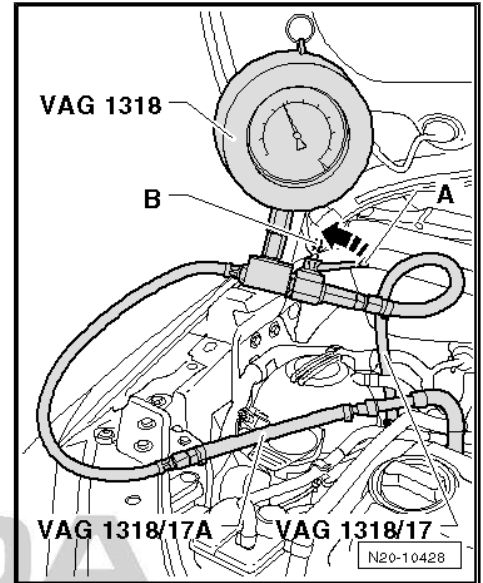
If the specified value is not reached:

- Check the fuel pressure before the fuel filter. For this step connect the pressure gauge -V.A.G 1318- with the adapter set -V.A.G 1318/17A- between the fuel filter and the fuel feed line.
- Open shut-off cock of the pressure gauge. Lever points in direction of flow.
- Start engine and run in idle.



Caution

The shut-off cock must only be closed slowly. At a fuel pressure of 0.8 MPa (8 bar), the shut-off cock must be immediately opened, in order to avoid a damage of the pressure gauge.



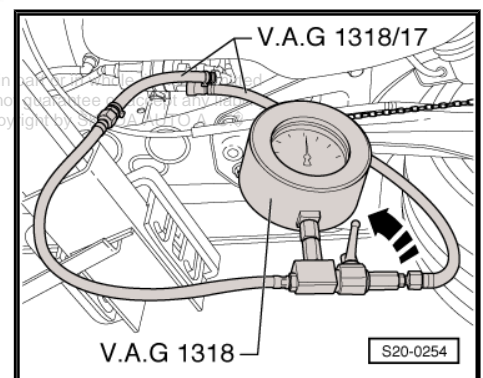
- Slowly close the shutoff cock of the pressure measuring device. The pressure must rise to at least 0.6 MPa (6.0 bar). If the 0.6 MPa (6.0 bar) is reached, immediately open the shut-off cock again!

If the pressure has risen:

- Fuel pump O.K., pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the pressure does not rise:

- Fuel pump defective, replace the fuel delivery unit ➔ [page 117](#) .

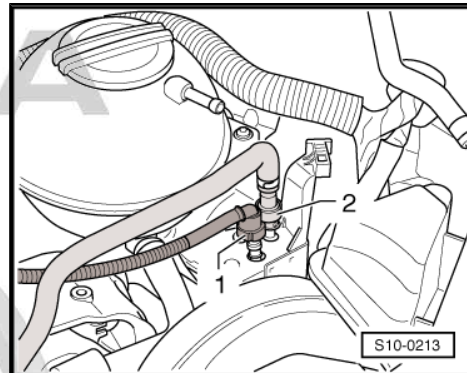


1.7.3 Check fuel pressure with pressure gauge -VAS 6550 -

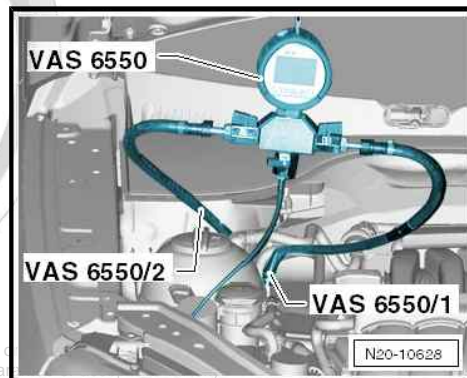
- The function of the fuel pump was checked ➔ [page 121](#) .

**Note**

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Remove the fuel feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- to the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4...0.7 MPa (4...7.0 bar)

**If fuel line is o.k.:**

- Test holding pressure ⇒ [page 125](#).

If the specified pressure is exceeded:

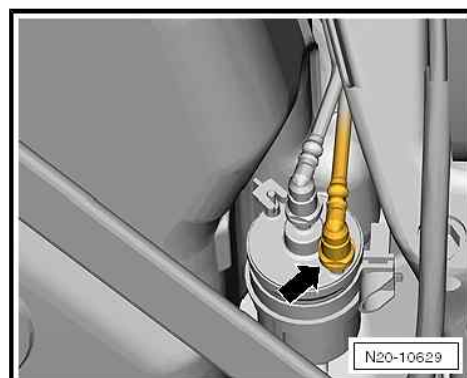
- Check the fuel return-flow line between the fuel filter and fuel pump for kinks and blockages.

If no fault is found:

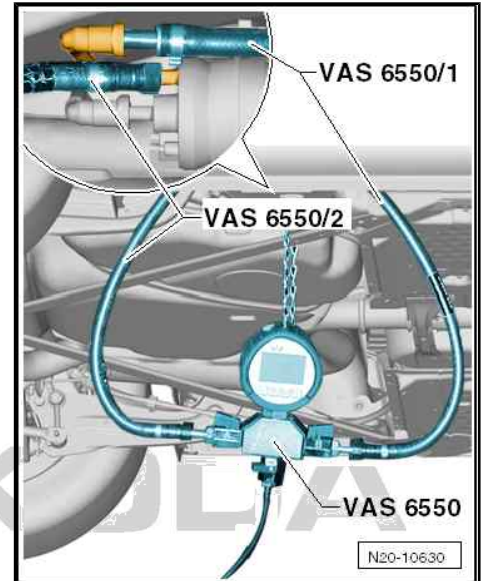
- Pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the specified value is not reached:

- Check the fuel pressure before the fuel filter; to do so proceed as follows:
- Disconnect fuel feed line -arrow- at fuel filter.



- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- between the fuel filter and the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Start engine and run in idle.



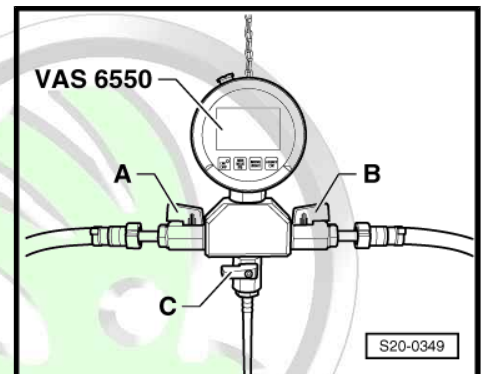
- Slowly close the shutoff cock -A-.
- The pressure must rise to at least 0.7 MPa (7.0 bar).
- If the 0.7 MPa (7.0 bar) is reached, immediately open the shut-off cock again!

If the pressure has risen:

- Fuel pump O.K., pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the pressure does not rise:

- Fuel pump defective, replace fuel delivery unit ➔ [page 117](#).



1.7.4 Checking holding pressure with pressure gauge -V.A.G 1318-

- Fuel pressure O.K. and pressure gauge - V.A.G 1318- connected in the engine compartment ➔ [page 122](#).

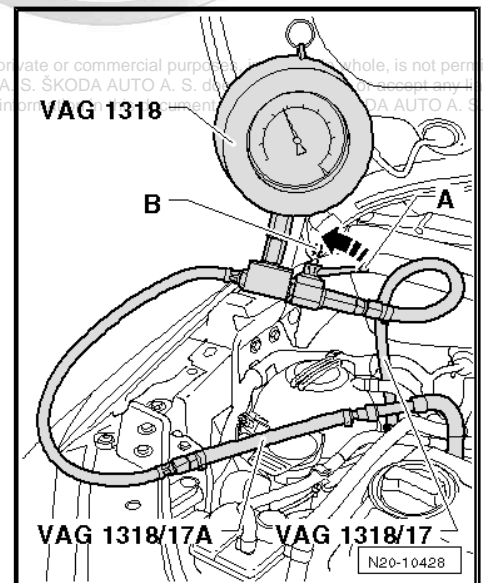


Note

- ◆ *Safety precautions when working on the fuel supply system* ➔ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system* ➔ [page 5](#).
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4...0.7 MPa (4...7.0 bar)
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.



- Immediately close the shutoff cock of the pressure measuring device. The lever then points in the position -B-.

If the pressure again drops:

- Check the low pressure pipe to the high pressure pump for tightness.

If no fault is found:

- Replace high pressure pump ⇒ [page 164](#) .

Now the pressure does no longer drop:

- Check the fuel line to the fuel filter for tightness.

If the fuel line is not found to be faulty:

- Check the non-return valve in the fuel delivery unit. For this step connect the pressure measuring device -V.A.G 1318- with the adapter -V.A.G 1318/17A- between the fuel filter and the fuel feed line.

- Open shut-off cock of the pressure gauge. Lever points in direction of flow.

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.

- Read off fuel pressure on the pressure gauge.

- Specified value: 0.4...0.7 MPa (4...7.0 bar)

- Immediately close the shut-off cock of the pressure measuring device after the pressure has built up.

- Observe pressure drop at pressure gauge.

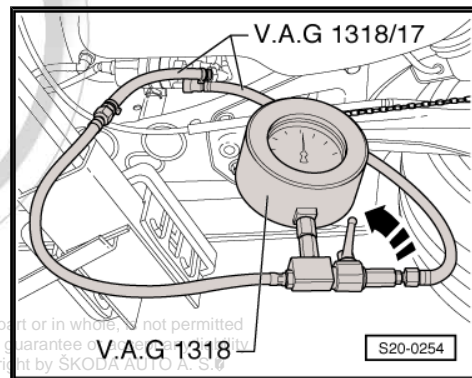
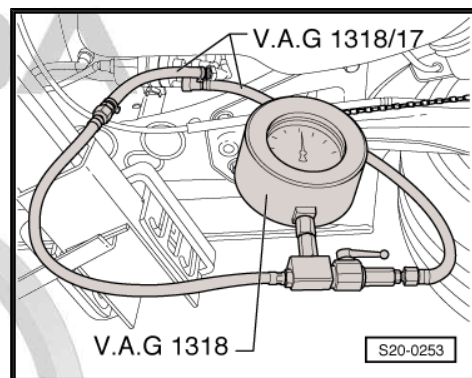
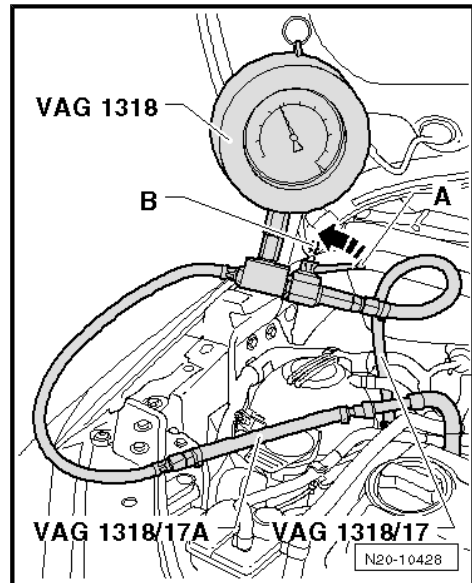
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

- Non-return valve in the fuel pump faulty, replace fuel delivery unit ⇒ [page 117](#) .

If the pressure does not drop:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.



1.7.5 Checking holding pressure with pressure gauge -VAS 6550-

- Fuel pressure O.K. and pressure gauge - VAS 6550- connected in the engine compartment ➔ [page 123](#) .



Note

- ◆ *Safety precautions when working on the fuel supply system*
➔ [page 3](#) .
- ◆ *Rules of cleanliness when working on the fuel supply system*
➔ [page 5](#) .

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4...0.7 MPa (4...7.0 bar)
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure still drops:

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Immediately close the shut-off cock -B- of the pressure gauge after the pressure has built up. The lever points at right angles in the direction of flow of the fuel arrow.

Now the pressure does no longer drop:



Note

Search for leakage on the engine side. Repeat the holding pressure test. This time, however, the shut-off cock -A- is closed in order to determine if in fact there is a leakage on the engine side.

- Check the low-pressure line to the high pressure pump for tightness.

If no fault is found:

- Replace high pressure pump ➔ [page 164](#) .

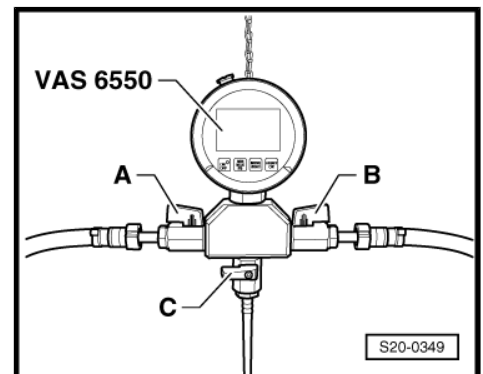
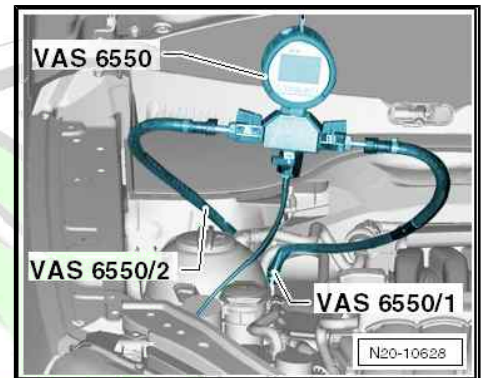
If the pressure again drops:

Search for leakage on the fuel tank side, to do so proceed in the following manner:

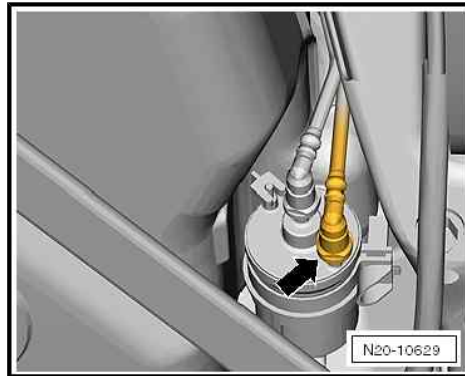
- Check the fuel line to the fuel filter for tightness.

If the fuel line is not found to be faulty:

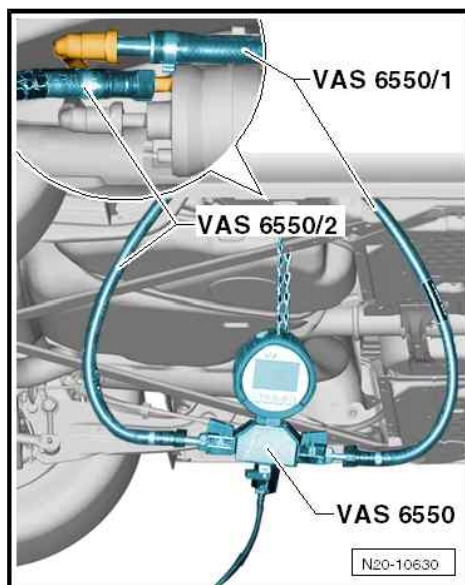
- Check the pressure holding valve in the fuel delivery unit. To do so proceed in the following manner:



- Disconnect fuel feed line -arrow- at fuel filter.



- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- between the fuel filter and the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4...0.7 MPa (4...7.0 bar)



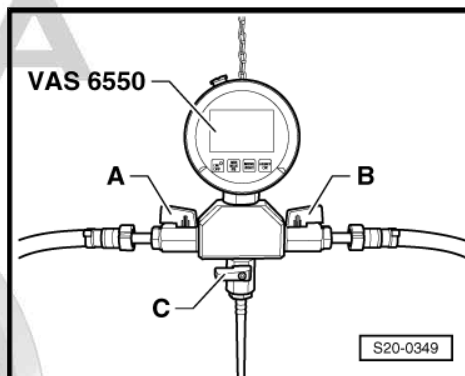
- After the pressure has built up, close the shut-off cock -A-.
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

- Non-return valve in the fuel pump faulty, replace fuel delivery unit ➔ [page 117](#).

If the pressure does not drop:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.



1.7.6 Checking fuel flow rate with pressure gauge -V.A.G 1318 -



Note

- ♦ *Safety precautions when working on the fuel supply system*
➔ [page 3](#).

- ♦ *Rules of cleanliness when working on the fuel supply system* part or in whole, is not permitted unless authorised by ŠKODA AUTO A. S. ŠKODA AUTO A. S. does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by ŠKODA AUTO A. S.

- Switch off the ignition and all electrical components and take out the ignition key.

- Removing rear seat bench ⇒ Body Work ⇒ Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

Vehicles with auxiliary heating.

- Unplug the 2-pin plug of the dosing pump -V54- .

Continued for all vehicles

- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch. If the plug connection was not correctly positioned, this could cause a fault.
- Now unplug the plug -1-.
- Check the contacts at the plug and at the fuel delivery unit for damage.

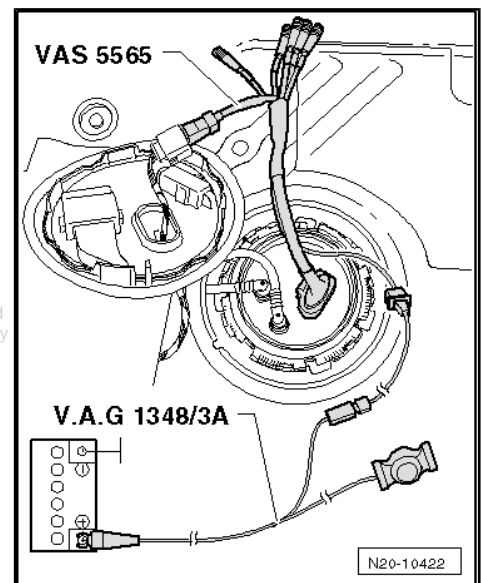
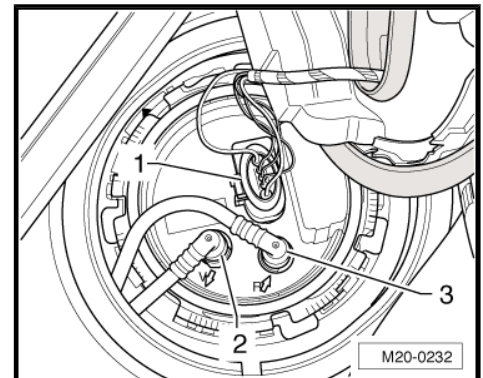
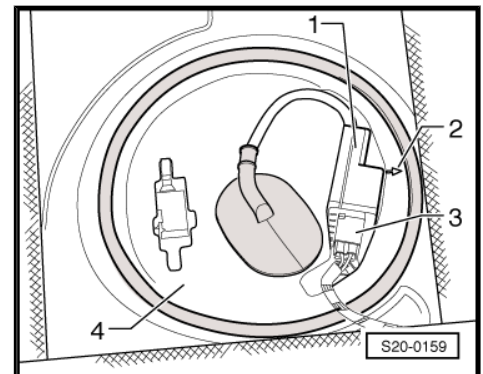
- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect remote control -V.A.G 1348/3A- to adapter -VAS 5565- and to battery positive (+).



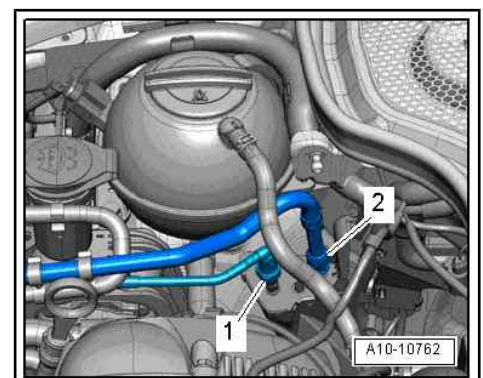
Note

This step is only intended to ensure that the fuel delivery unit runs when the engine is switched off.

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- Remove the fuel feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.





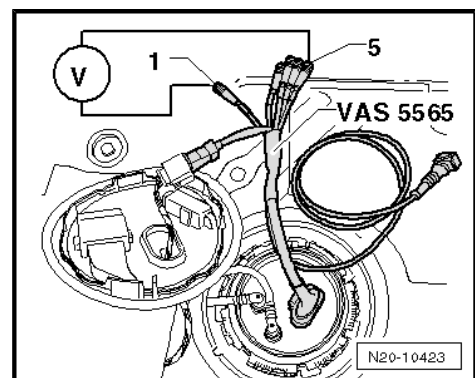
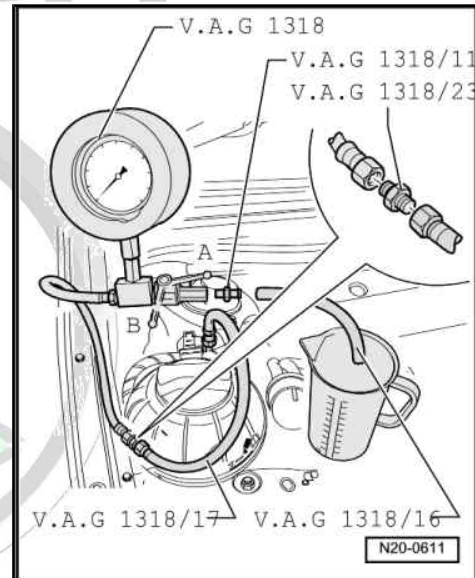
- Connect the pressure gauge - V.A.G 1318- with the double connection piece -V.A.G 1318/23- and the adapter set -V.A.G 1318/17A- to the fuel feed line.
- Fit the hose adapter -V.A.G 1318/16- onto the adapter -V.A.G 1318/11- of the pressure measuring device and hold it in a measuring vessel.
- Close the shut-off cock of the pressure measuring device. The lever then points in the position -B-.



WARNING

Danger of liquid spraying out when opening the shut-off valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact. Hold the container in front of the free connection to the pressure gauge.

- Open shut-off cock of the pressure gauge. The lever then points in the direction of flow -A-.
- Activate remote control -V.A.G 1348/3A - . While doing so, slowly close the shut-off cock until the pressure gauge displays 0.4 MPa (4 bar) overpressure. Now do not make any further changes to the position of the shut-off cock.
- Empty measuring glass.
- The fuel flow rate of the fuel delivery unit is dependent on the battery voltage. For this reason, additionally connect the multimeter - V.A.G 1715- to the outgoing circuits -1 and 5- of the adapter for measuring method/DSO (5-pin) -VAS 5565- .
- Activate remote control for 30 seconds while measuring the battery voltage.



- Compare the fuel rate with the specified value.

*) minimum flow rate 1 cm³/30 s

**) Voltage at the fuel delivery unit when engine not running and unit operating (approx. 2 volts less than battery voltage).

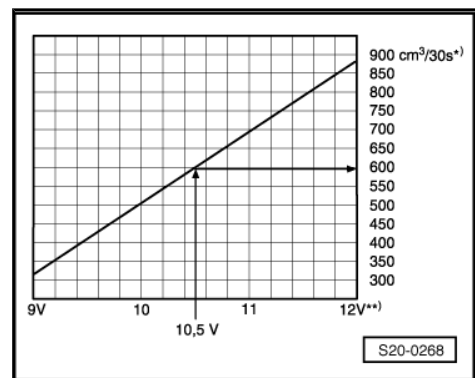
Read out examples:

During the test a voltage of 12.5 V was measured on the battery. As the voltage on the fuel pump is approximately 2V less than the battery voltage, a minimum flow rate of 580 cm³/30 s is obtained.

If the minimum delivery volume is not reached:

- Check the fuel lines for possible restrictions (kinks) or blocking.

If no fault is found:



- Disconnect the feed hose -1- from the fuel filter inlet.
- Connect pressure gauge -V.A.G 1318- with the adapter set - V.A.G 1318/17A- to the hose.
- Repeat fuel flow rate test.

If the minimum flow rate is now reached:

- Replace fuel filter.

If the minimum flow rate is again not reached:

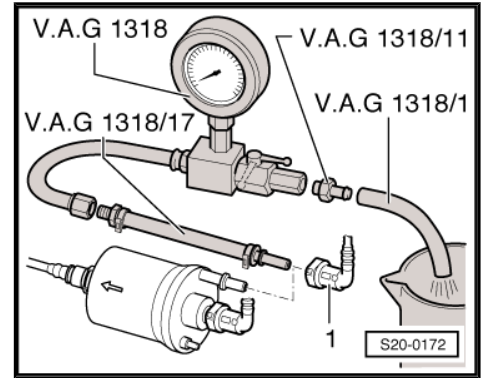
- Remove fuel delivery unit and inspect the filter strainer for soiling.

If you have still not found any fault up to this stage:

- Replacing fuel delivery unit ⇒ [page 117](#) .

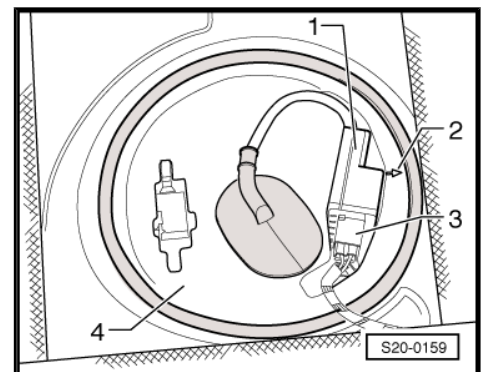
If the required fuel delivery volume has been achieved, but a fault is still suspected in the fuel supply system (e.g. intermittent breakdown of the fuel supply):

- Check power consumption of the fuel delivery unit
⇒ [page 134](#) .

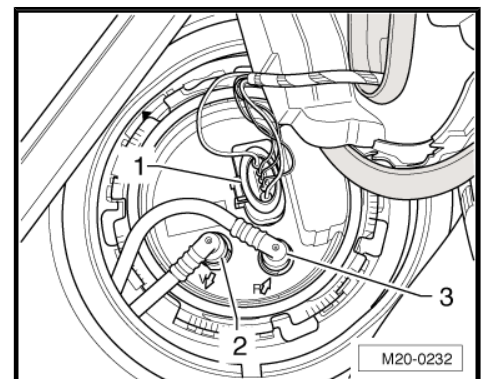


1.7.7 Checking fuel flow rate with pressure gauge -VAS 6550 -

- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work ⇒ Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.



- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch. If the plug connection was not correctly positioned, this could cause a fault.
- Now unplug the plug -1-.
- Check the contacts at the plug and at the fuel delivery unit for damage.



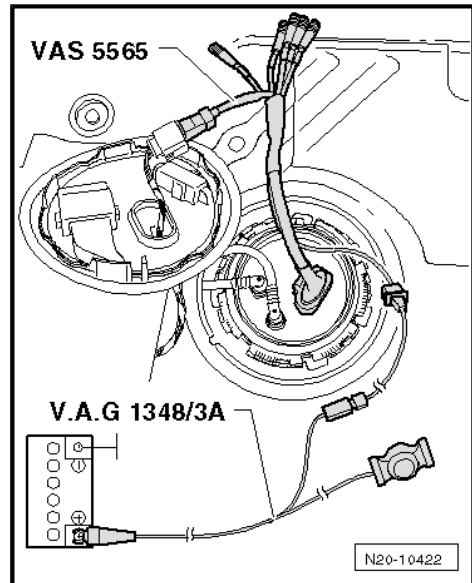
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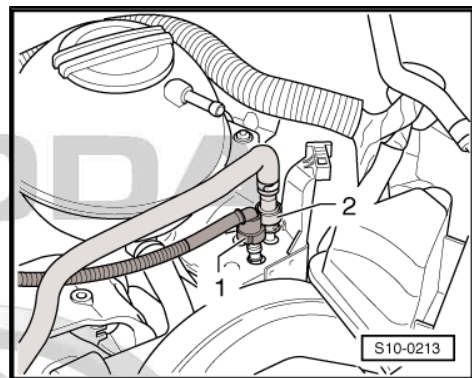
- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect remote control -V.A.G 1348/3A- to adapter -VAS 5565- and to battery positive (+).

**Note**

This step is only intended to ensure that the fuel delivery unit runs when the engine is switched off.



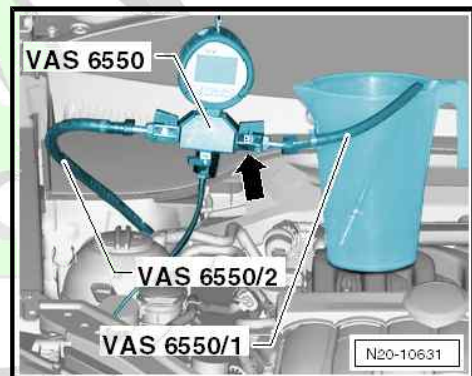
- Disconnect the fuel feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



- Connect the pressure gauge -VAS 6550- with the adapter -VAS 6550/2- to the fuel feed line. Hold the adapter -VAS 6550/1- in a measuring vessel.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.

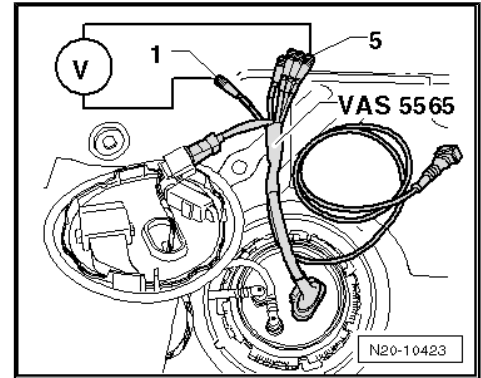
**WARNING**

Danger of liquid spraying out when opening the shut-off valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Hold the container in front of the free connection to the pressure gauge.



- Activate remote control -V.A.G 1348/3A-. While doing this, slowly close the shut-off cock -arrow- until the pressure gauge displays 0.4 MPa (4 bar) overpressure. Now do not make any further changes to the position of the shut-off cock.
- Empty measuring glass.

- The fuel flow rate of the fuel pump is dependent on the battery voltage. For this reason, additionally connect the multimeter - V.A.G 1715- to the outgoing circuits -1 and 5- of the adapter for measuring method/DSO (5-pin) -VAS 5565- .
- Activate remote control for 30 seconds while measuring the battery voltage.



- Compare the fuel rate with the specified value.

*) minimum flow rate 1 cm³/30 s

**) Voltage at fuel delivery unit when engine not running and delivery unit operating.

Read out examples:

During the test a voltage of 10.5 V was measured. Thus a minimum flow rate of 580 cm³/30 s is obtained.

If the minimum delivery volume is not reached:

- Check the fuel lines for possible restrictions (kinks) or blocking.

If no fault is found:

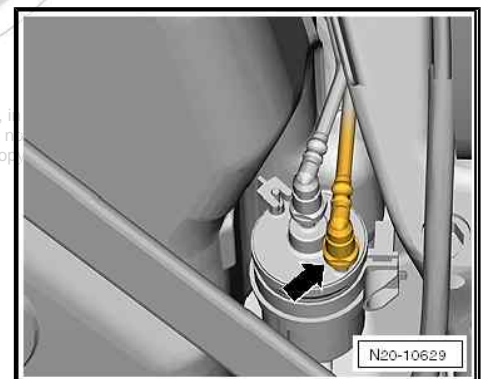
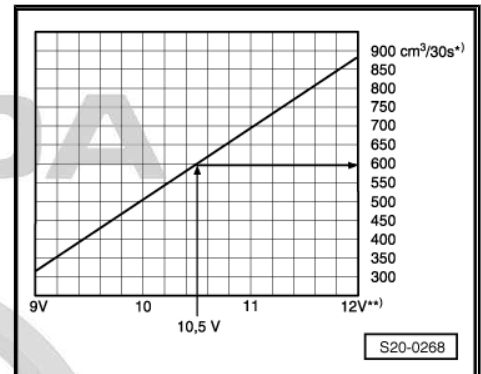
- Take cap off fuel filler neck and repeat the test.

If the fuel flow rate is now reached:

- Check the ventilation of the fuel tank.

If the minimum flow rate is again not reached:

- Check the fuel filter, to do so proceed as follows:
- Disconnect fuel feed line -arrow- at fuel filter.



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- Connect the pressure gauge -VAS 6550- with the adapter -VAS 6550/1- to the fuel feed line. Hold the adapter -VAS 6550/2- in a measuring vessel.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Repeat fuel flow rate test.

If the minimum flow rate is now reached:

- Replace fuel filter.

If the minimum flow rate is again not reached:

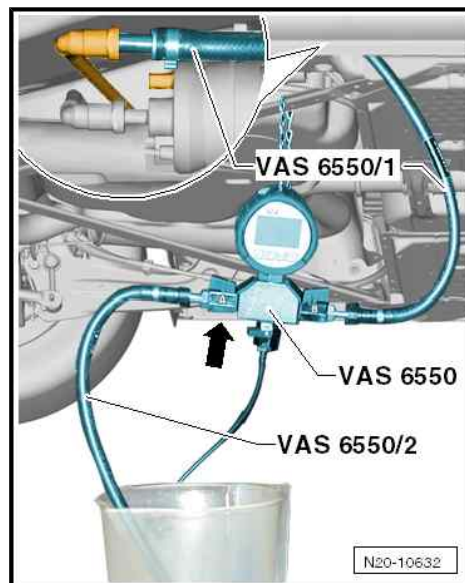
- Remove fuel delivery unit and inspect filter strainer for soiling.

If you have still not found any fault up to this stage:

- Replacing fuel delivery unit ⇒ [page 117](#) .

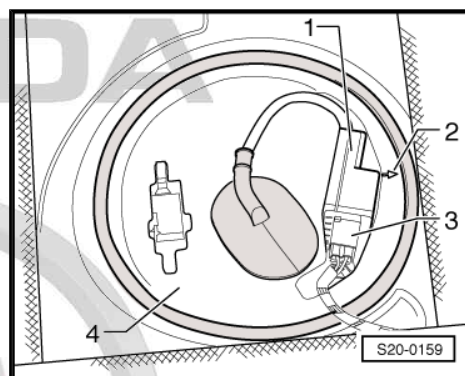
If the required fuel flow rate has been achieved, but a fault is still suspected in the fuel supply system (e.g. intermittent breakdown of the fuel supply):

- Check power consumption of the fuel pump ⇒ [page 134](#) .



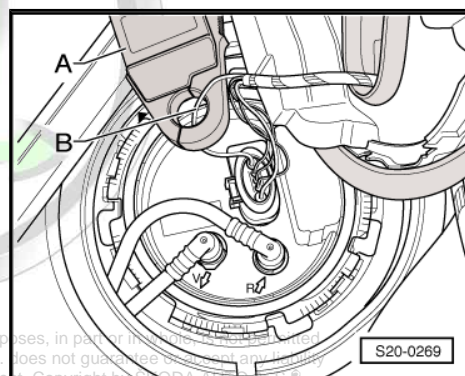
1.7.8 Check power consumption

- Fold up rear seat.
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.



- Connect the current probe -A- of the vehicle diagnosis, measurement and information system -VAS 5051- on the line -B- to contact 1 of the 5-pin plug.

If the current probe cannot be connected on the line -B- to contact 1 of the 5-pin plug because of the length of the insulation:



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- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect the current probe -A- to the red cable - with the lettering "current probe" - of the adapter for measuring method/DSO (5-pin) -VAS 5565- .

Continued for all

- Start engine and run in idle.
- Measure voltage consumption of the fuel pump.
Specified value: max. 9 A

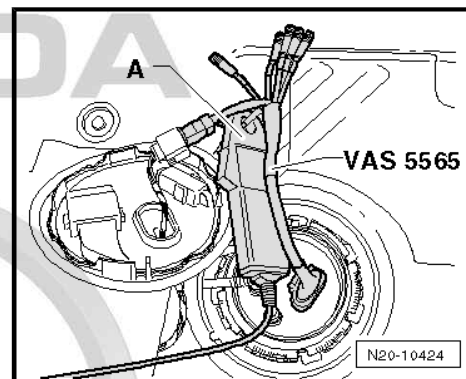


Note

If the fault in the fuel supply system is intermittent then tests can be undertaken during a test drive but then two people are required for this.

If the specified current uptake is exceeded:

- Fuel pump defective, replace the fuel delivery unit
⇒ page 117 .



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2 Electronic Engine Power Control (Electronic throttle)

2.1 Accelerator pedal module - Summary of components

1 - Connector

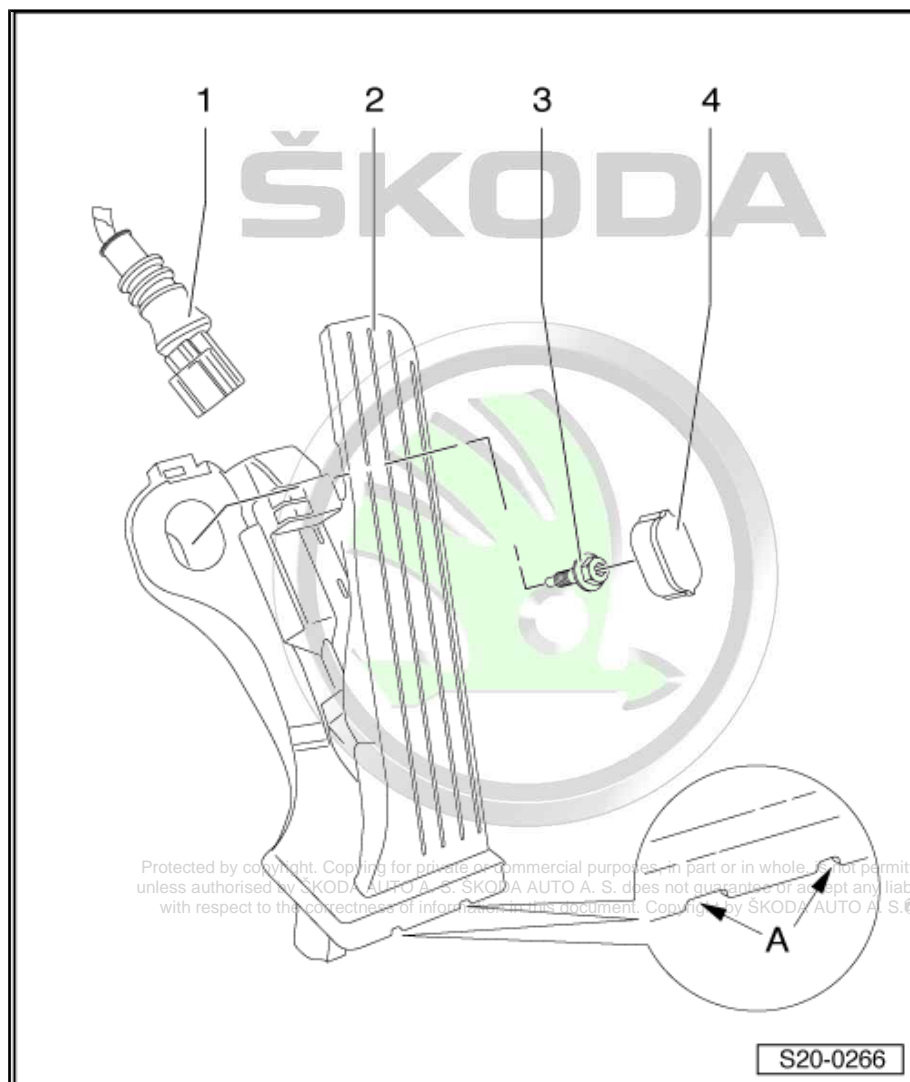
- ☐ black, 6 pin

2 - Accelerator pedal position sender -G79- with accelerator pedal position sender 2 -G185-

- ☐ not adjustable
- ☐ the accelerator pedal sender transmits the driver's instructions to the engine control unit
- ☐ -A- openings for release tool
- ☐ removing and installing
⇒ [page 136](#)
- ☐ when replacing, the engine control unit must be adapted ⇒ Vehicle diagnosis, testing and information system VAS 5051 on vehicles with automatic gearbox

3 - 10 Nm

4 - Cap



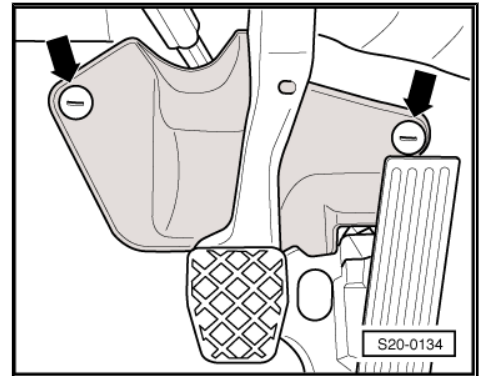
2.2 Removing and installing accelerator pedal module

Special tools and workshop equipment required

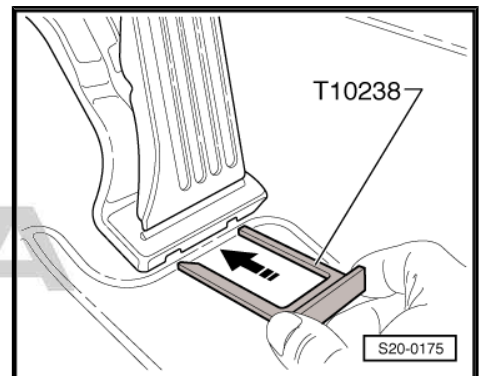
- ◆ Release tool -T10238- (for left-hand drive vehicle)
- ◆ Release tool -T10240- (for right-hand drive vehicle)

Removing

- Remove cover for the steering column -arrows-.
- Lever out the cap with a screwdriver (➔ [page 136](#) , Pos. 4).
- Unscrew fixing screw (➔ [page 136](#) , Pos. 3).

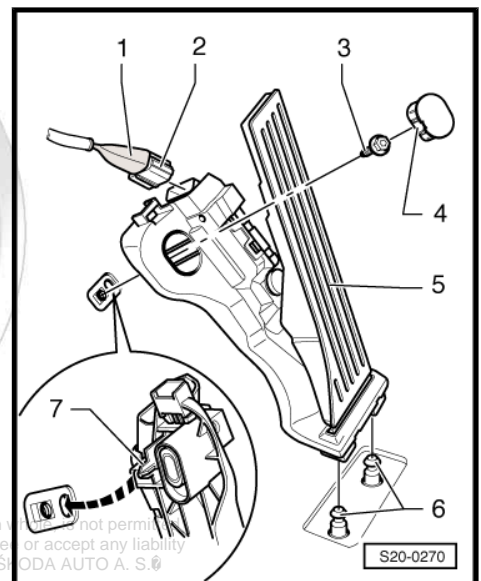


- Push the release tool -T10238 - (on right-hand drive vehicles release tool -T10240 -) as shown up to the stop into the provided openings and remove the accelerator pedal module.
- Disconnect connector at accelerator pedal module ➔ [page 138](#) .



Install

- Mount plug -2- at accelerator pedal module -5- ➔ [page 138](#) .
The connector must lock audibly.
- Push accelerator pedal module onto the retaining bolts -6-.
- Insert the centering pin -7- into the hole on the underbody.
- Fasten accelerator pedal module with screw -3- (10 Nm) and fit on cap -4-.
- Re-install the cover for the steering column.
- If the accelerator pedal module was replaced, an adaptation of the engine control unit has to be performed on vehicles with automatic gearbox ➔ Vehicle diagnosis, testing and information system VAS 5051.



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2.2.1 Disconnect connector for accelerator pedal module and fit on



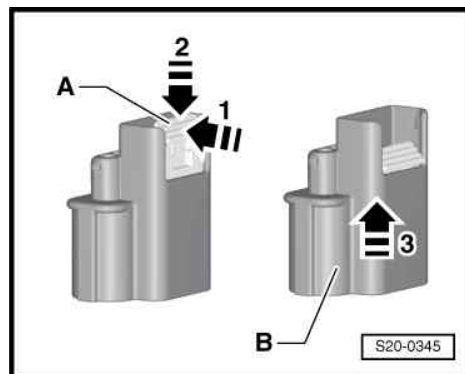
Note

The plugs for the accelerator pedal module which are inserted, must be disconnected and fit on in a different manner.

Disconnect connector 1K0 973 706

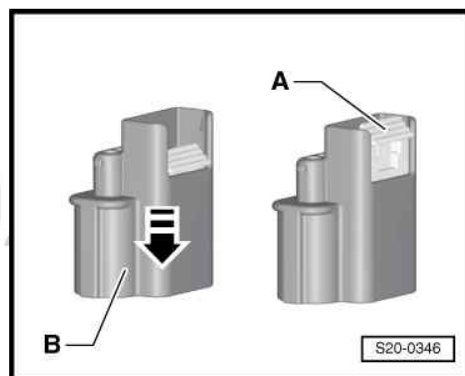
- Slightly press the piston slide valve -A- (grey) in -direction of arrow 1- and push it up to the stop in -direction of arrow 2-.
- Hold the piston slide valve in this position and disconnect the socket housing -B- upwards in -direction of arrow 3-.

The piston slide valve -A- remains in the bottom position.



Fit on connector 1K0 973 706

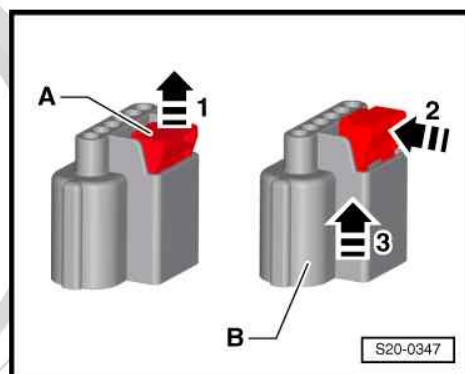
- Push the socket housing -B- down in -direction of arrow- until the housing can be heard to lock in place.
- The piston slide valve -A- moves automatically upwards.
- For safety reasons, check the connector for secure catch by tightening it in the opposite direction.



Disconnect connector 8K0 973 706

- Pull piston slide valve -A- (red) upwards in -direction of arrow 1- up to the stop.
- Press the piston slide valve in -direction of arrow 2- and disconnect the socket housing -B- upwards in -direction of arrow 3-.

The piston slide valve -A- remains in the top position.

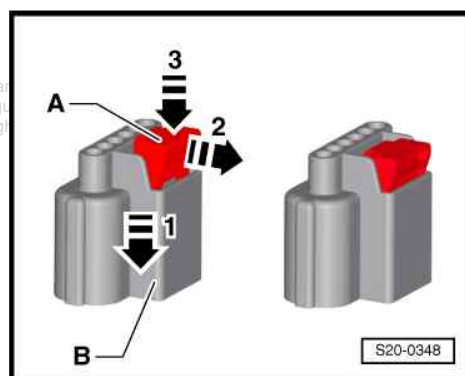


Fit on connector 8K0 973 706

- Push the socket housing -B- down in -direction of arrow 1- up to the stop.
- Slightly press the piston slide valve in -direction of arrow 2- and push it down in -direction of arrow 3-.

The piston slide valve -A- can only be pushed down if the socket housing was pushed "up to the stop".

- For safety reasons, check the connector for secure catch by tightening it in the opposite direction.



3 Activated charcoal container system

3.1 Activated charcoal container system - Summary of components



Note

- ◆ The hose connections are secured with spring strap clips or clamp-type clips.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ Use pliers for spring strap clips to fit the spring strap clips.
- ◆ Safety precautions when working on the fuel supply system ➔ [page 3](#).
- ◆ Rules of cleanliness when working on the fuel supply system ➔ [page 5](#).

1 - Activated charcoal filter

- ☐ Fitting position: in right of engine compartment
- ☐ if the catch peg is unlocked, the activated charcoal filter can be removed from the holder
- ☐ Checking the fuel tank venting ➔ [page 139](#)

2 - Pressure holding valve with connection hose

3 - 8 Nm

4 - Vent line

- ☐ check for firm seating
- ☐ from fuel tank

5 - 8 Nm

6 - Support

- ☐ for activated charcoal filter

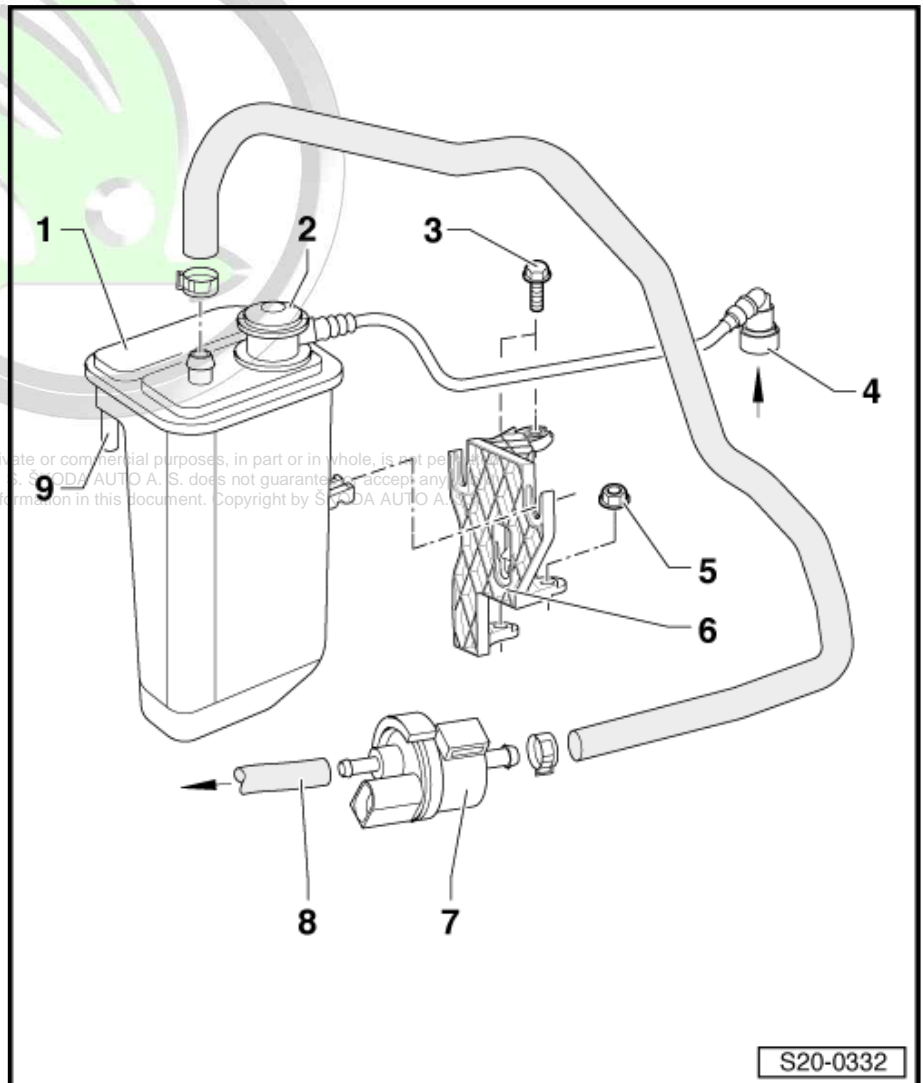
7 - Solenoid valve 1 for activated charcoal filter -N80-

- ☐ Valve closed when ignition is switched off
- ☐ valve is actuated (pulsed) by engine control unit when engine is warm

8 - Connecting hose

- ☐ To intake manifold
- ☐ check for firm seating

9 - Air admission fitting



3.2 Checking the fuel tank venting

Special tools and workshop equipment required

- ◆ Hand vacuum pump , e.g. -VAS 6213-

- ◆ Adapter set , e.g. - V.A.G 1318/17A-
- ◆ Adapter , e.g. -V.A.G 1318/20-1-



Note

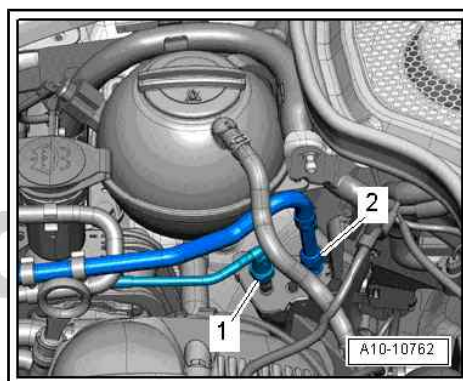
- ◆ *The adapter set -V.A.G 1318/17A- replaces the adapter set -V.A.G 1318/17- .*
- ◆ *The figures shown in the descriptions were not changed for this reason.*

Test condition

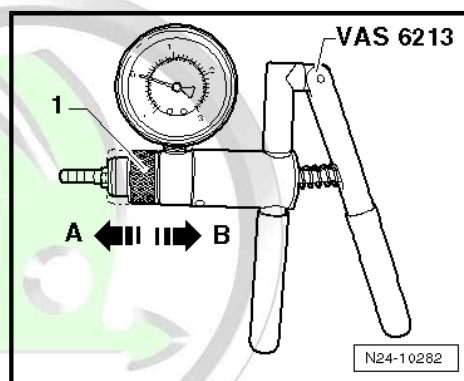
- The ignition must be switched off.

Test sequence

- Detach vent line -1-. To do so press in the securing ring.



- Slide the control ring -1- on the hand vacuum pump -VAS 6213- in -the direction of arrow B- up to the stop.
- Operate the hand vacuum pump -VAS 6213 - several times.

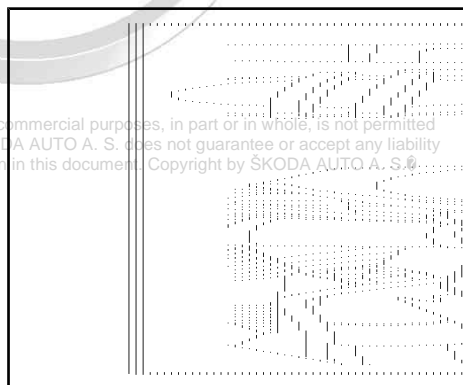


- Then connect the hand vacuum pump - VAS 6213- -1- on the vent line -2- as shown in the figure.
- Operate the hand vacuum pump -VAS 6213- several times.
- No vacuum should build up.

If a vacuum builds up.

- Check the air admission fitting on the activated charcoal filter for dirt and clean as required.

If no vacuum builds up:



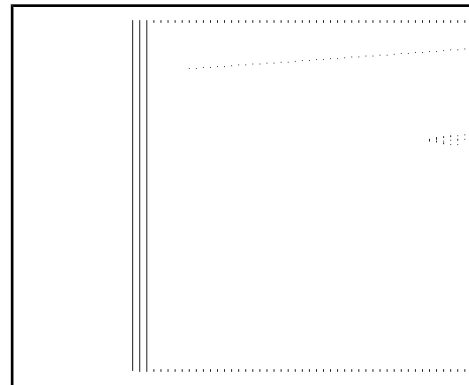
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- Shut off air admission fitting -arrow- and once again operate the vacuum pump several times.
- A vacuum should build up.

If no vacuum builds up:

- Replace activated charcoal filter.



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21 – Turbocharging

1 Exhaust gas turbocharger



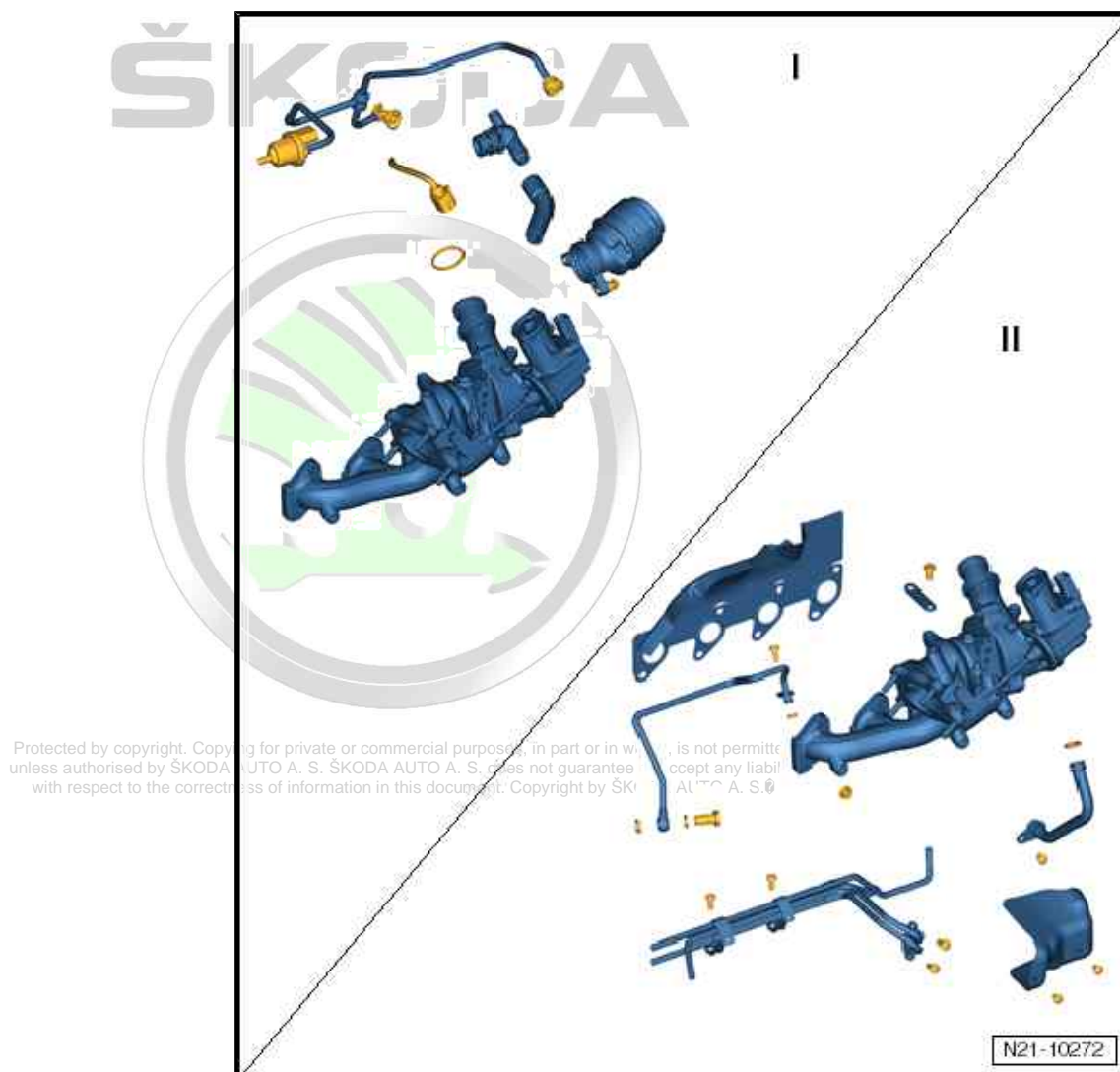
Note

Observe the general notes for assembly work on the charge air system ⇒ [page 7](#).

1.1 Exhaust turbocharger - Summary of components

Part I. ⇒ [page 143](#)

Part II. ⇒ [page 144](#)





1.1.1 Part I.

1 - Activated charcoal filter solenoid valve 1 -N80-

- ☐ To intake manifold

2 - Non-return valve

- ☐ Fitting location: cylinder head cover

3 - Connecting hose

4 - 8 Nm

5 - Inlet connection

6 - Exhaust turbocharger with exhaust manifold

- ☐ with charge pressure regulator -V465 -



Note

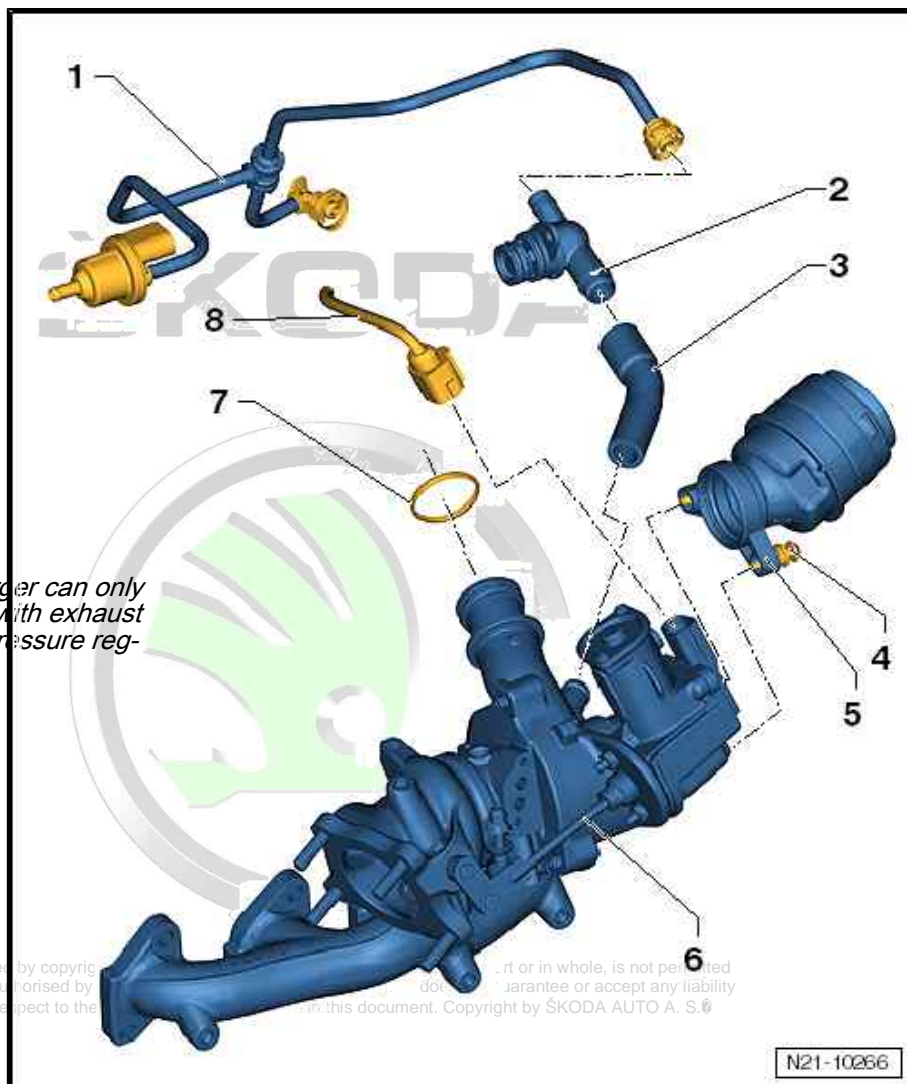
The exhaust turbocharger can only be replaced complete with exhaust manifold and charge pressure regulator -V465- .

- ☐ removing and installing
⇒ [page 144](#)

7 - O-ring

- ☐ replace

8 - Connector



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N21-10266

1.1.2 Part II.

1 - Gasket

- ☐ replace

2 - Support

3 - 20 Nm

4 - Exhaust turbocharger with exhaust manifold

- ☐ with charge pressure regulator -V465 -



Note

The exhaust turbocharger can only be replaced complete with exhaust manifold and charge pressure regulator -V465-.

- ☐ removing and installing
⇒ [page 144](#)

5 - O-ring

- ☐ replace

6 - Oil return pipe

7 - 8 Nm

8 - 10 Nm

9 - Heat shield

10 - 8 Nm

11 - Coolant pipes

12 - 8 Nm

13 - 18 Nm

- ☐ observe the order of tightening up
⇒ [page 144](#)

- ☐ Tightening torque of pin screw in cylinder head: 18 Nm (insert oiled)

14 - Sealing ring

- ☐ replace

15 - Hollow screw

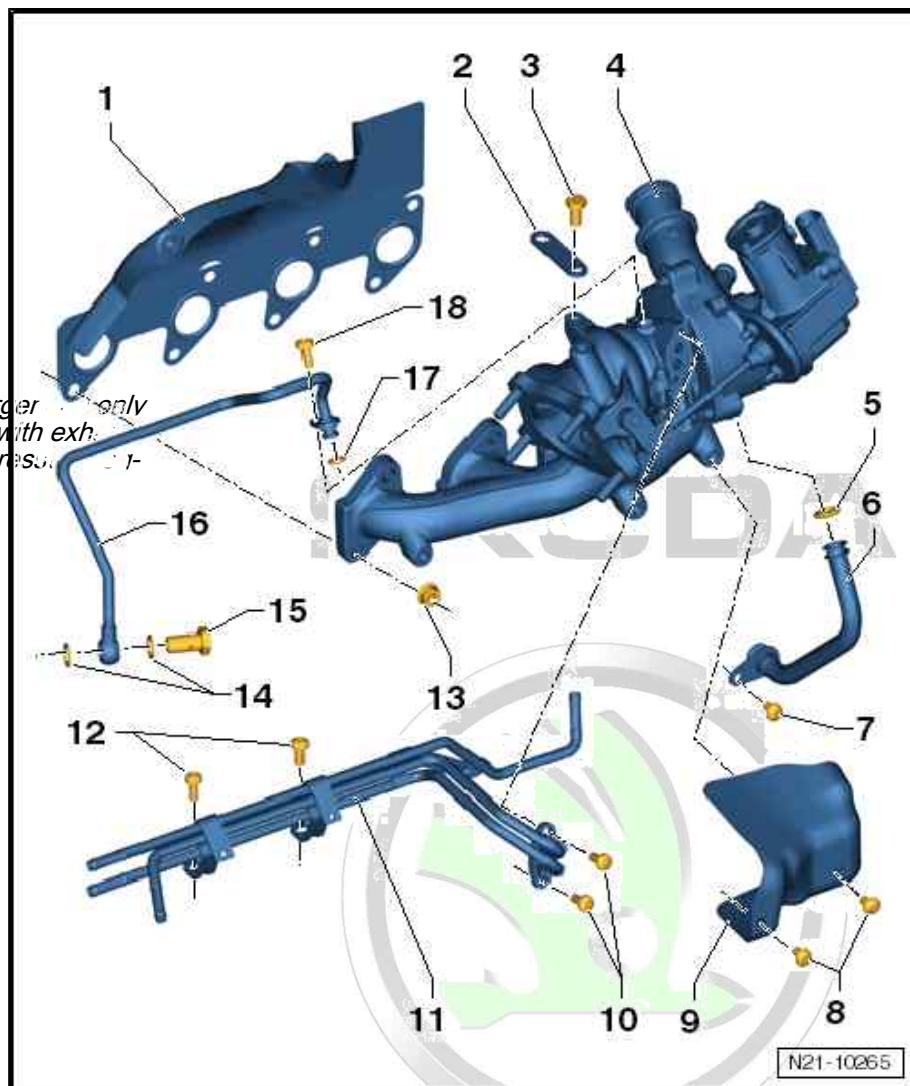
- ☐ Tightening torque: 20 Nm

16 - Oil feed pipe

17 - O-ring

- ☐ replace

18 - 8 Nm



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1.2 Removing and installing exhaust gas turbocharger

Special tools and workshop equipment required

- ◆ Pliers for spring strap clamps
- ◆ Catch pan , e.g. -VAS 6208 -



- ◆ Hot screw paste -G 052 112 A3-



Caution

In case a mechanical damage to the exhaust gas turbocharger is found, e.g. damage to the compressor wheel, it is not sufficient to only replace the turbocharger. In order to avoid consequential damage, perform the following tasks:

- ◆ *Clean all oil lines.*
- ◆ *Change the engine oil and replace the oil filter*
- ◆ *Inspect the air filter housing, the air filter element and the intake hoses for contaminations.*
- ◆ *Inspect the whole charge-air routing and the charge air cooler for foreign bodies.*

If foreign bodies are detected in the charge air system, the charge-air routing must be cleaned and the charge air cooler must be replaced.



Note

- ◆ *Observe the rules for cleanliness ➔ [page 3](#) .*
- ◆ *Observe general instructions for charge-air system ➔ [page 7](#) .*

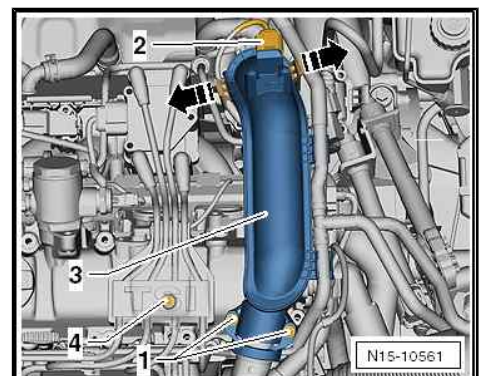
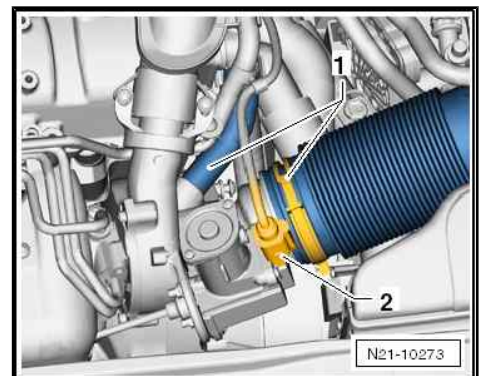
Removing

- Disconnect battery ➔ Electrical System ➔ Rep. Gr. 27 .
- Remove V-ribbed belt ➔ [page 26](#) .
- Drain coolant ➔ [page 99](#) .
- Detach hoses -1- and plugs -2- from exhaust gas turbocharger.
- Release screws -1- and remove retaining clip.

- Disconnect plug -2- at charge pressure sender -G31- with intake air temperature sender 2 -G299 - .
- Release the catches in -direction of arrow- and detach the pressure pipe -3- first of all from the throttle valve control unit -J338- and then from the exhaust gas turbocharger.

- Fold open the cover -4- and release the fixing screw.

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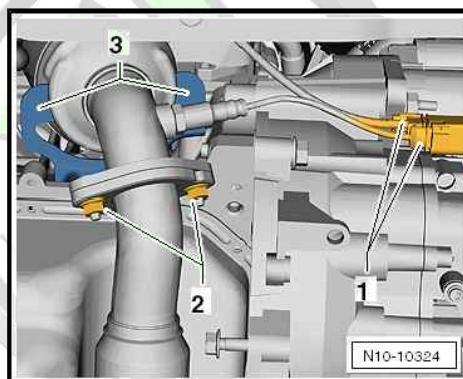
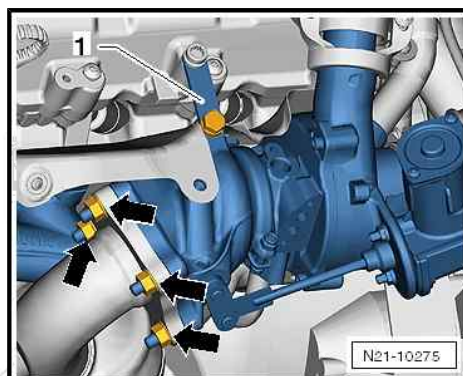
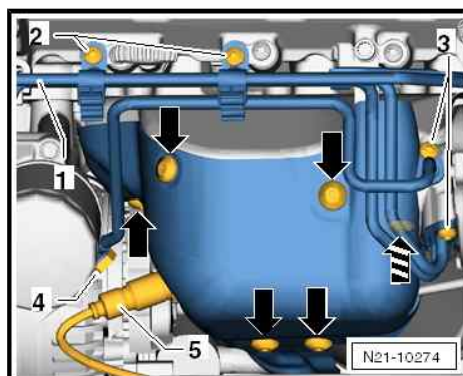
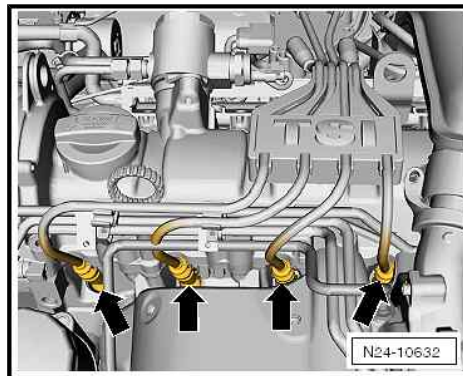
- Disconnect all the spark plug connectors -arrows- using the extractor -T10112 A- from the spark plugs and lay the ignition cables to the rear.
- Detach coolant hoses from coolant pipes -1-.



Note

*Make sure that the oil does not penetrate into the generator!
Therefore, cover the generator with a clean cloth!*

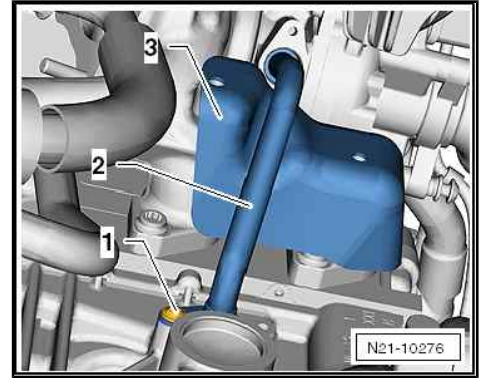
- Unscrew the hollow screw -4- of the oil pipe.
- Release fixing screws -2- and -3- and remove oil and coolant pipes.
- Remove lambda probe -G39- -5-.
- Release the top fixing screw of the AC generator and press the generator slightly downwards.
- Release fixing screws -arrows- and remove the heat shield from the exhaust turbocharger.
- Remove holder -1-.
- Unscrew fixing nuts -arrows- at exhaust gas turbocharger.
- Remove bottom noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Separate plug connections -1-.
- Unscrew fixing nuts -2-.
- Release the fixing screws of the bracket -3- and remove the catalytic converter downwards.



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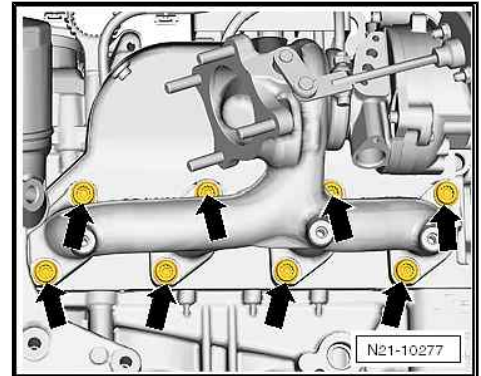
- Release the fixing screw -1- of the oil return pipe -2- and pull the oil return pipe out of the exhaust gas turbocharger.
- Release the fixing screws of the heat shield -3- and remove the panel from the exhaust manifold.



- Unscrew all the fixing nuts -arrows- of the exhaust manifold.
- Remove exhaust manifold with turbocharger from cylinder head.
- Remove the gasket from the stud bolts.

Install

- Position exhaust turbocharger with exhaust manifold and gasket at cylinder head.



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- Tighten the fixing nuts to 18 Nm in the specified order -A- to -H-.

Further installation occurs in reverse order, while paying attention to the following:



Note

- ◆ After installing the turbocharger, run engine at idling speed for about 1 minute to ensure that oil is supplied to the turbocharger.
- ◆ Replace the gaskets, the sealing rings and the self-locking nuts.
- ◆ Fill the exhaust turbocharger with engine oil at the connection fitting for the oil feed line.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before being installed.
- ◆ Secure all hose connections with corresponding hose clips.

Tightening torques:

Exhaust gas turbocharger - Summary of components part I.

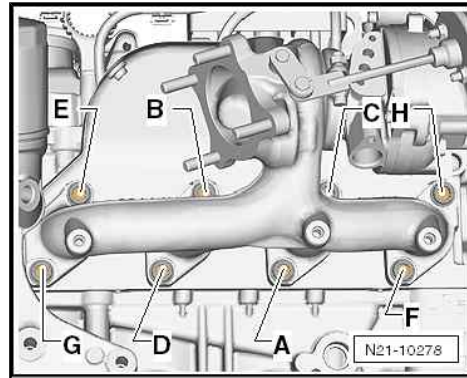
⇒ [page 143](#)

Exhaust gas turbocharger - Summary of components part II.

⇒ [page 144](#)

Catalytic converter and component parts - Summary of components ⇒ [page 178](#)

- Attach AC generator ⇒ Electrical System; Rep. Gr. 27 ; removing and installing AC generator .
- Install the V-ribbed belt ⇒ [page 26](#) .
- Top up coolant ⇒ [page 99](#) .
- Connect battery ⇒ Electrical System ⇒ Rep. Gr. 27 .



2 Charge air system with exhaust gas turbocharger

Observe the general notes for assembly work on the charge air system ➔ [page 7](#).

2.1 Charge air system - Summary of components

Note

- ◆ This engine is fitted with a radiator combination of engine and low temperature radiators for charge air system.
- ◆ Engine and low temperature radiators are arranged as one component part.

1 - Radiator with low temperature radiator for charge air system

- ☐ removing and installing ➔ [page 108](#)

2 - Intake manifold

- ☐ removing and installing ➔ [page 159](#)

3 - Seal

- ☐ pay attention to correct seating when installing the charge air cooler

4 - Gasket

- ☐ replace if damaged

5 - Charge air cooler

- ☐ removing and installing ➔ [page 150](#)

6 - Coolant hose

- ☐ to exhaust gas turbocharger

7 - 7 Nm

- ☐ when installing first tighten evenly by hand, then tighten crosswise from the inside to the outside to the recommended tightening torque

8 - Coolant hose

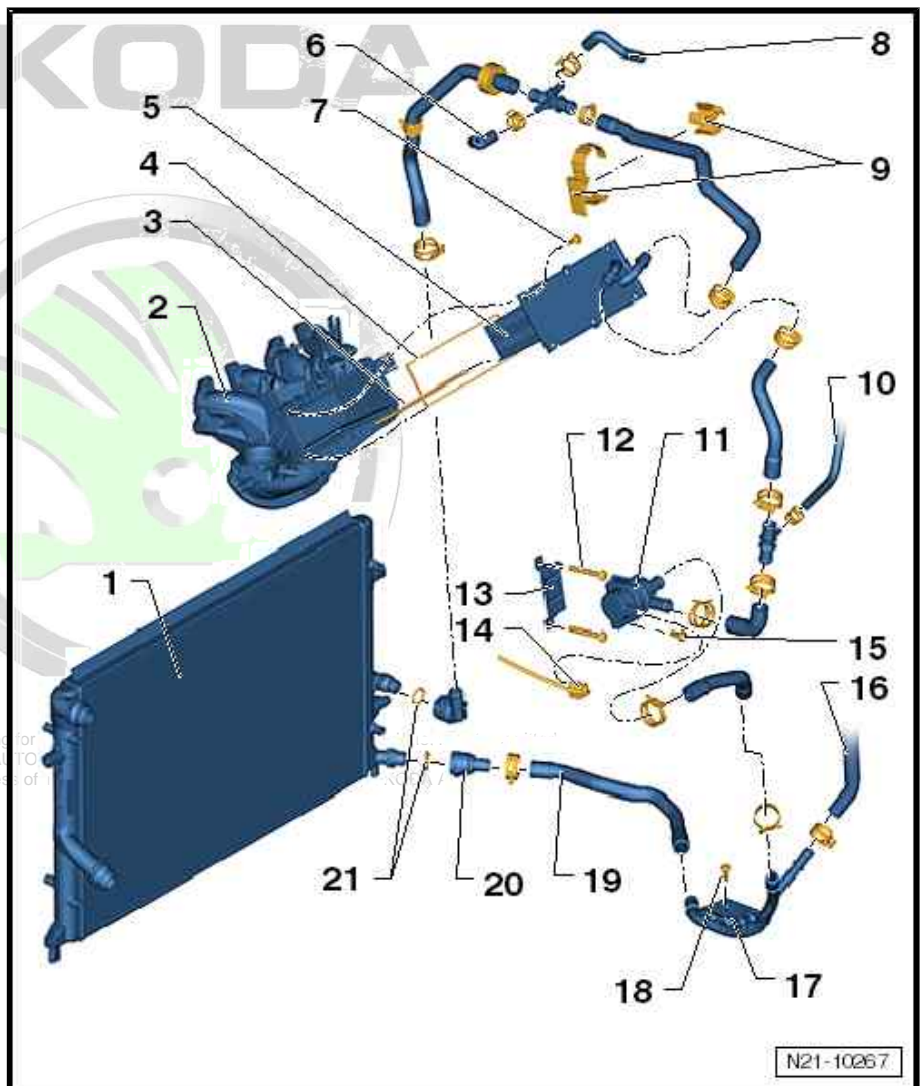
- ☐ to the expansion reservoir

9 - Hose clamp

- ☐ attached to the timing case

10 - Coolant hose

- ☐ to exhaust gas turbocharger



N21-10267

**11 - Coolant recirculation pump -V50-**

- ☐ removing and installing ⇒ [page 105](#)

12 - 8 Nm**13 - Support****14 - Connector****15 - 10 Nm****16 - Coolant hose**

- ☐ to engine oil cooler

17 - Coolant pipe

- ☐ attached to the oil pan

18 - 8 Nm**19 - Bottom coolant hose****20 - Connection fittings****21 - O-ring**

- ☐ replace if damaged

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2.2 Removing and installing charge air cooler

Special tools and workshop equipment required

- ◆ Hose clamps up to Ø 25 mm -MP7-602 (3094) -
- ◆ Pliers for spring strap clamps
- ◆ Catch pan , e.g. -VAS 6208-

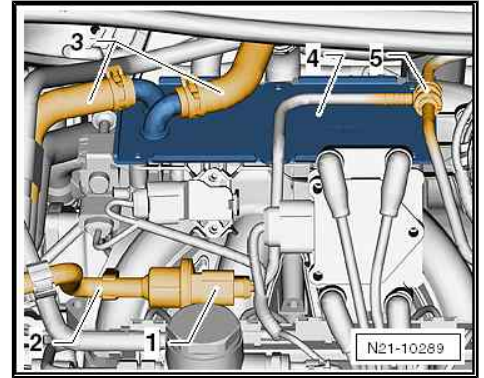
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Observe the general notes for assembly work on the charge air system ⇒ [page 7](#) .

Removing

- Disconnect plug -1- and hose -3- from activated charcoal filter system solenoid valve 1 -N80- .
- Remove the lines with the non-return valve -5- and the activated charcoal filter system solenoid valve 1 -N80- from the intake manifold.
- Pinch off coolant hoses -3- with hose clamps -3094 - and detach from charge-air cooler.
- Release the fixing screws of the ignition transformer -N152- and carefully place the ignition transformer onto the cylinder head cover.
- Release fixing screws at charge air cooler -4-.
- Carefully pull the charge air cooler -4- out of the intake manifold.



Note

Pour the residual coolant out of the charge air cooler into a collecting tank.

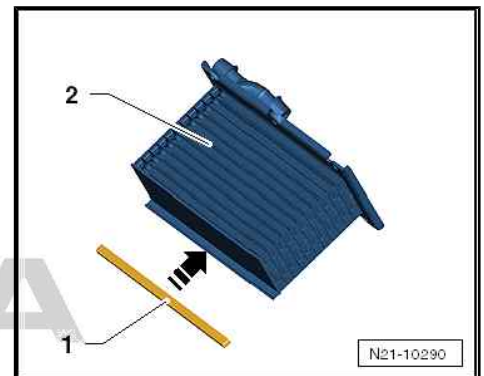
Install

Installation is performed in the reverse order, pay attention to the following points:

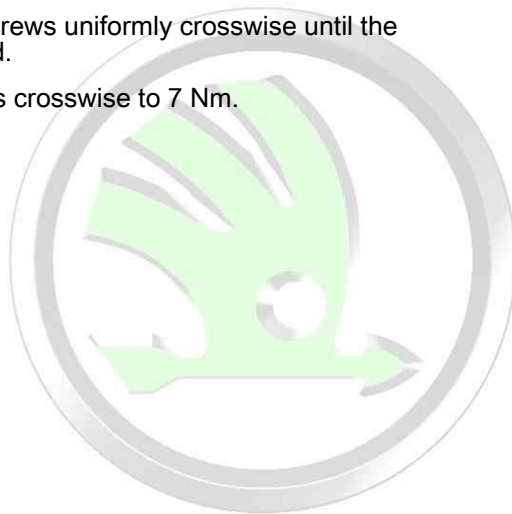
- Slide the seal -1- in -direction of arrow- onto the edge of the charge air cooler -2-.
- Check the correct seating of the new gasket at the intake manifold.
- Slide the charge air cooler into the intake manifold.
- Press down the charge-air cooler up to the stop into the intake manifold.

Note

Do not tilt the charge-air cooler when installing.



- First tighten the fixing screws uniformly crosswise until the screw head is positioned.
- Tighten the fixing screws crosswise to 7 Nm.



24 – Fuel Formation, Injection

1 Fitting location of the injection system

1 - Oil pressure switch -F1-

- ☐ in the left cylinder head
- ☐ check ➔ [page 96](#)

2 - Solenoid valve for coolant circuit -N492-

3 - Solenoid valve 1 for activated charcoal filter -N80-

4 - Intake manifold pressure sender -G71- and intake air temperature sender -G42-

5 - Engine control unit -J623-

- ☐ removing and installing ➔ [page 176](#)

6 - Control valve for fuel pressure -N276-

7 - Knock sensor 1 -G61-

- ☐ at rear cylinder block
- ☐ 20 Nm

8 - Hall sender -G40-

9 - Ignition transformer -N152-

- ◆ D ignition transformer = ignition cable cyl. 1
- ◆ B ignition transformer = ignition cable cyl. 2
- ◆ C ignition transformer = ignition cable cyl. 3
- ◆ A ignition transformer = ignition cable cyl. 4

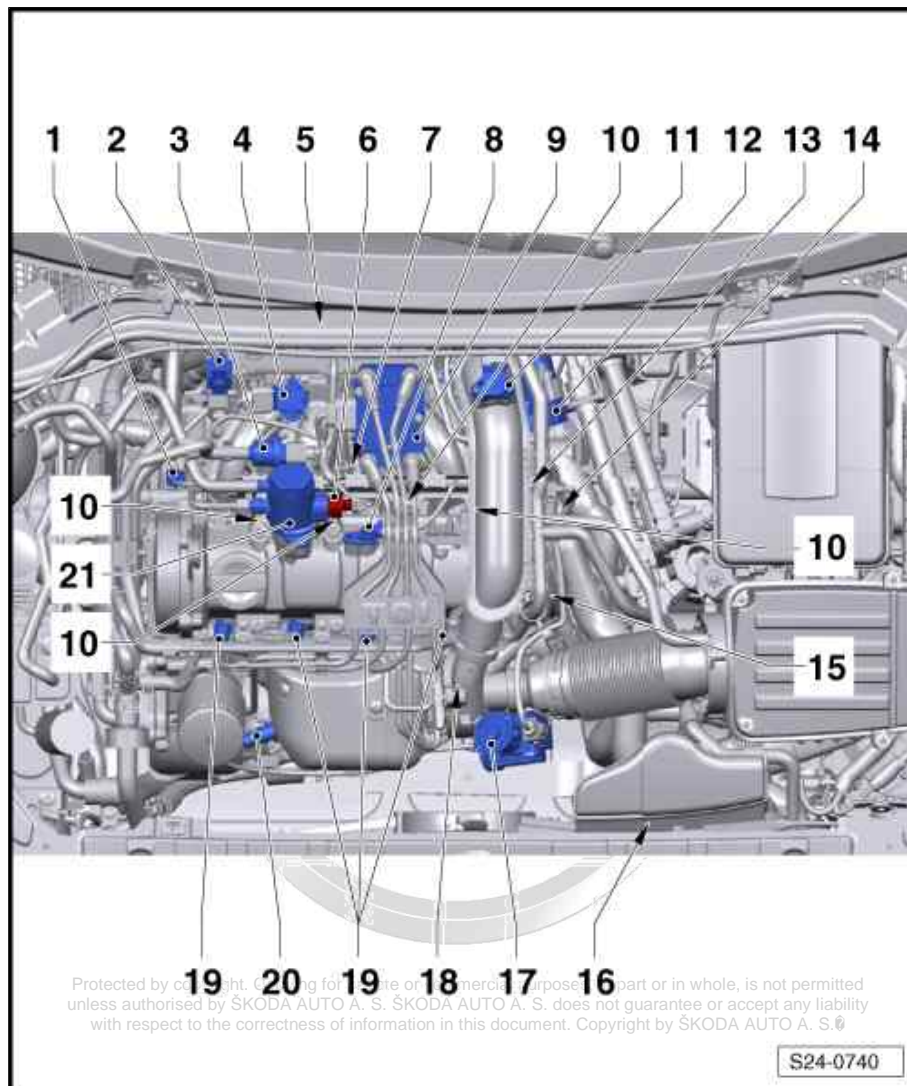
10 - Injection valves

- ☐ Injection valve for cylinder 1 -N30-
- ☐ Injection valve for cylinder 2 -N31-
- ☐ Injection valve for cylinder 3 -N32-
- ☐ Injection valve for cylinder 4 -N33-
- ☐ with Teflon gasket ring and supporting washer
- ☐ after removing the injection valve, the Teflon gasket ring and the supporting washer must be replaced ➔ [page 169](#)
- ☐ Removing and installing the injection valves ➔ [page 167](#)

11 - Charge pressure sender -G31- with intake air temperature sender 2 -G299-

12 - Throttle valve control unit -J338-

- ☐ removing and installing ➔ [page 157](#)
- ☐ clean ➔ [page 159](#)
- ☐ in case of replacement, erase initialisation values and adapt the engine control unit -J623- ➔ Vehicle diagnosis, testing and information system VAS 5051.





13 - Fuel pressure sender -G247-

- ☐ check ➔ [page 173](#)

14 - Engine speed sender -G28-

- ☐ removing and installing ➔ [page 184](#)

15 - Coolant temperature sender -G62-

16 - Coolant temperature sender at radiator outlet -G83-

17 - Charge pressure regulator -V465 -



Note

*The charge pressure regulator -
V465- can only be replaced com-
plete with exhaust gas turbocharger
and exhaust manifold.*

18 - Lambda probe downstream of catalytic converter -G130- and heater of lambda probe 1 downstream of catalytic converter -Z29-

19 - Spark plugs, 25 Nm

20 - lambda probe -G39- and heating for lambda probe -Z19-

21 - High pressure pump with fuel pressure regulating valve -N276-

- ☐ removing and installing ➔ [page 164](#)

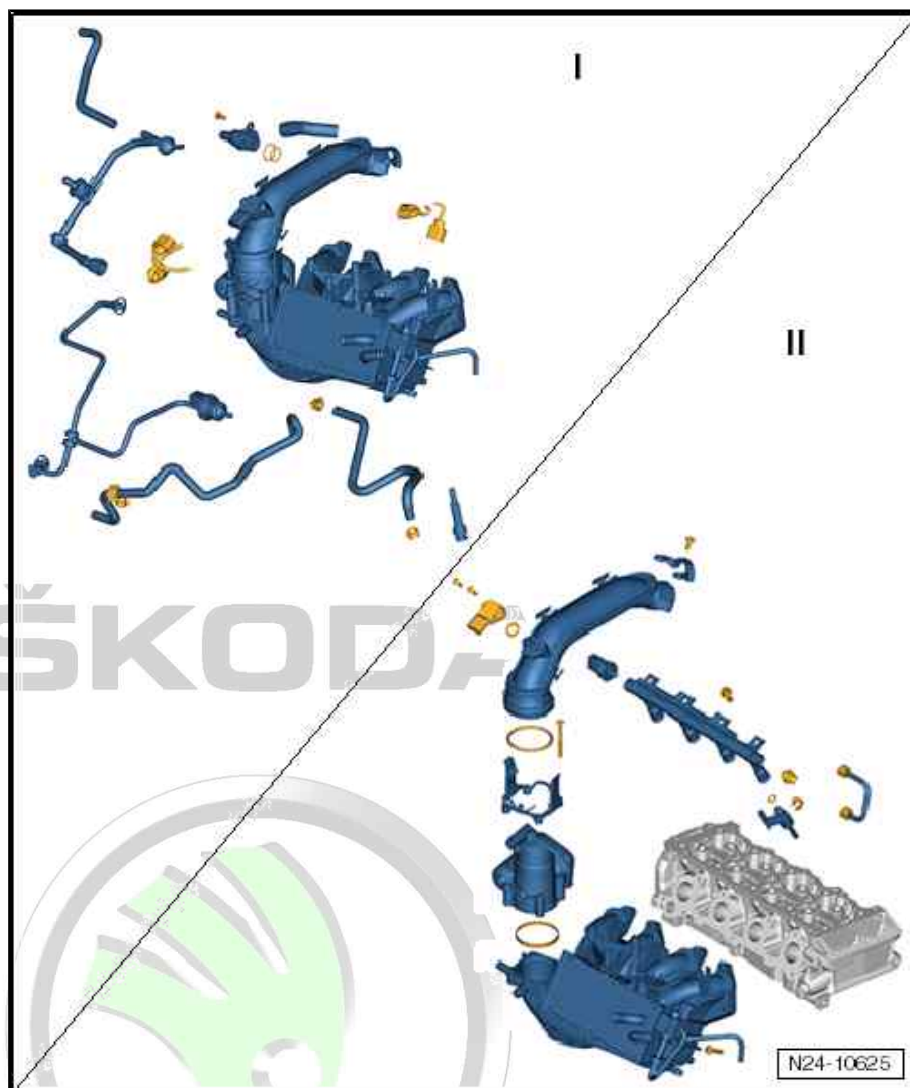
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2 Intake manifold and fuel distributor

2.1 Intake manifold - Summary of components

Part I. ➔ [page 155](#)

Part II. ➔ [page 156](#)



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2.1.1 Part I.

1 - Connecting hose

- ☐ at camshaft housing

2 - Connector

- ☐ for intake manifold pressure sender -G71-

3 - Connector

- ☐ for solenoid valve for coolant pump control

4 - 10 Nm

5 - Non-return valve

- ☐ for crankcase ventilation

6 - Connecting hose

- ☐ to exhaust gas turbo-charger

7 - O-ring

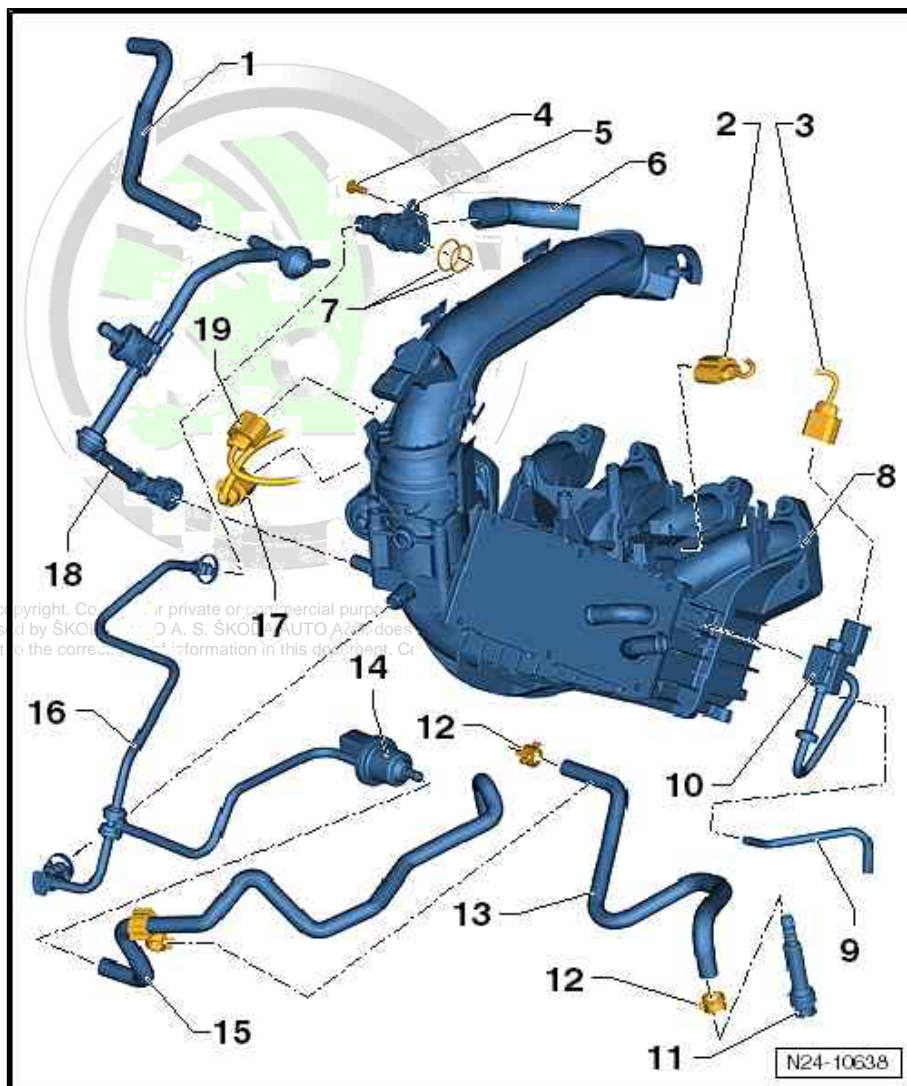
- ☐ replace

8 - Intake manifold

- ☐ removing and installing
⇒ [page 159](#)
- ☐ with intake manifold pressure sender -G71-

- ◆ The intake manifold pressure sender -G71- is attached to the intake manifold only using a plastic clip.

- ◆ If the plastic clip is damaged, attach the sender to the intake manifold with screws ⇒ Electronic Catalogue of Original Parts . Tightening torque: 3 Nm.



9 - Connecting hose

- ☐ to the coolant pump

10 - Solenoid valve for coolant circuit -N492-

11 - Connection fittings

12 - Clamp

13 - Fuel hose

- ☐ to high pressure pump

14 - Solenoid valve 1 for activated charcoal filter -N80-

15 - Connecting hose

- ☐ to the activated charcoal filter system

16 - Connecting hose

17 - Connector

- ☐ for throttle valve control unit -J338-



18 - Connecting hose

19 - Connector

- ☐ for Charge pressure sender -G31- with intake air temperature sender 2 -G299-

2.1.2 Part II.

1 - Pressure pipe

2 - 7 Nm

3 - Retaining clip

4 - Fuel pressure sender - G247- , 22 Nm

- ☐ Check fuel pressure sender -G247 -
⇒ [page 173](#)

5 - Fuel distributor

6 - 20 Nm

7 - 30 Nm

8 - 25 Nm

9 - 25 Nm

10 - O-ring

- ☐ replace

11 - Spring element

- ☐ replace each time the bottom part of the intake manifold is removed
- ☐ check for correct seating on injector

12 - Injection valve for cylinder 1 -N30-

- ☐ Injection valve for cylinder 2 -N31-
- ☐ Injection valve for cylinder 3 -N32-
- ☐ Injection valve for cylinder 4 -N33-
- ☐ with Teflon gasket ring and supporting washer

- ☐ after removing the injection valve, the Teflon gasket ring and the supporting washer must be replaced
⇒ [page 169](#)

- ☐ Removing and installing the injection valves ⇒ [page 167](#)

13 - Cylinder head

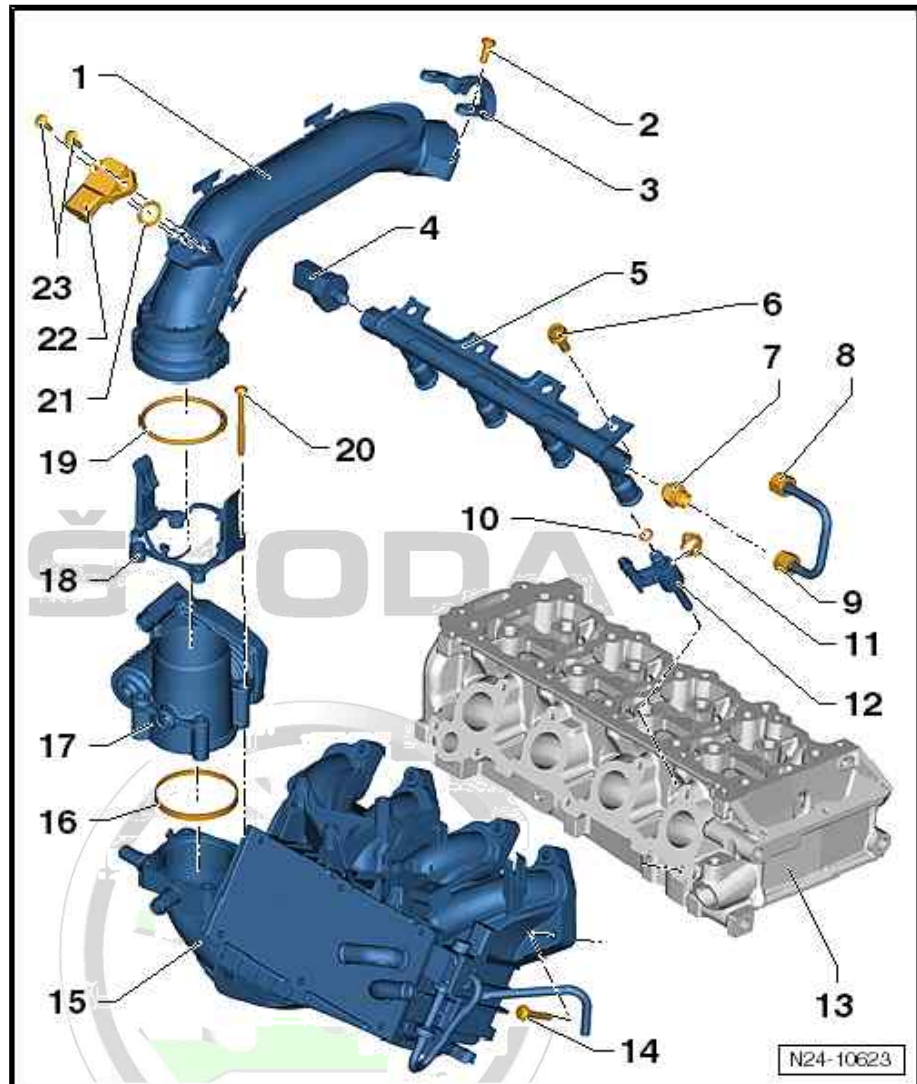
- ☐ removing and installing ⇒ [page 80](#)

14 - 20 Nm

15 - Intake manifold

- ☐ removing and installing ⇒ [page 159](#)
- ☐ with intake manifold pressure sender -G71-

- ◆ The intake manifold pressure sender -G71- is attached to the intake manifold only using a plastic clip.
- ◆ If the plastic clip is damaged, attach the sender to the intake manifold with screws ⇒ Electronic Catalogue of Original Parts . Tightening torque: 3 Nm.



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16 - Gasket

- ☐ replace

17 - Throttle valve control unit -J338-

- ☐ removing and installing ⇒ [page 157](#)
- ☐ clean ⇒ [page 159](#)
- ☐ in case of replacement, erase initialisation values and adapt the engine control unit -J623- ⇒ Vehicle diagnosis, testing and information system VAS 5051.

18 - Adapter

19 - O-ring

- ☐ replace

20 - 7 Nm

21 - O-ring

- ☐ replace

22 - Charge pressure sender -G31- with intake air temperature sender 2 -G299-

23 - 5 Nm

2.2 Removing and installing the throttle valve control unit -J338 -

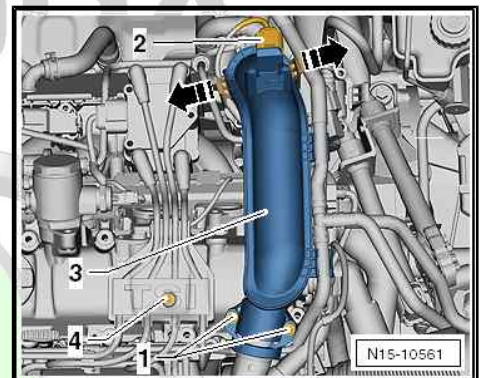


Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).

Removing

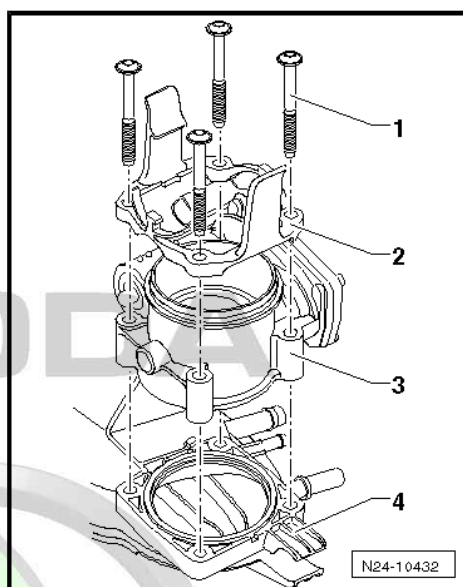
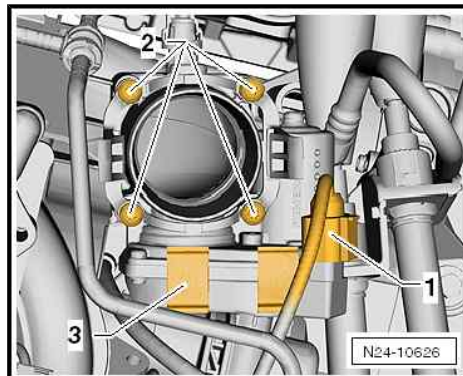
- Release screws -1- and remove retaining clip.
- Disconnect plug -2- at charge pressure sender -G31- with intake air temperature sender 2 -G299-.
- Release the catches in -direction of arrow- and detach the pressure pipe -3- first of all from the throttle valve control unit -J338 - and then from the exhaust gas turbocharger.



- Disconnect the plug -1- from the throttle valve control unit - J338 - .
- Release the fixing screws -2- and remove the throttle valve control unit -J338- from the intake manifold.

Install

- Insert a new gasket ring in the groove of the intake manifold.
- Position the throttle valve control unit -3- together with the adapter -2- and the fixing screws -1- onto the intake manifold -4-.

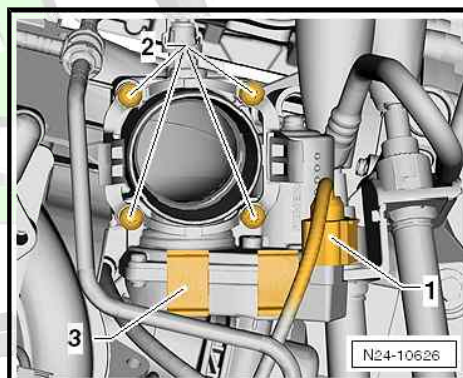


- Tighten fixing screws -2- to 7 Nm.
- Fit the plug -1- at the throttle valve control unit -3-.



Note

Before fitting the O-rings at the exhaust turbocharger and in the pressure pipe moisten slightly with engine oil.

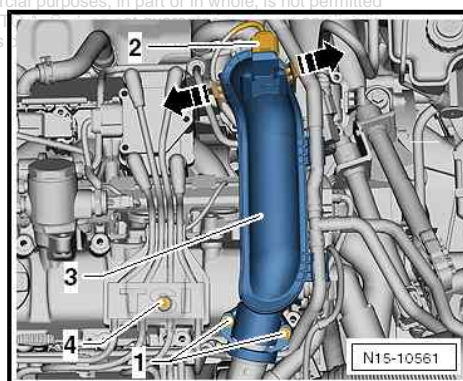


- Fit the pressure pipe -3- at the turbocharger.

- Press the pressure pipe -3- onto the throttle valve control unit.
- During this procedure the retaining clips must click audibly into place.
- Tighten screws -1- of retaining clip to 7 Nm.
- Connect plug -2- at charge pressure sender -G31- with intake air temperature sender 2 -G299 - .

If a new throttle valve control unit was installed:

- Erase initialisation values and adapt the engine control unit - J623- to the throttle valve control unit ⇒ Vehicle diagnosis, testing and information system VAS 5051.





2.3 Clean throttle valve control unit -J338-

Note

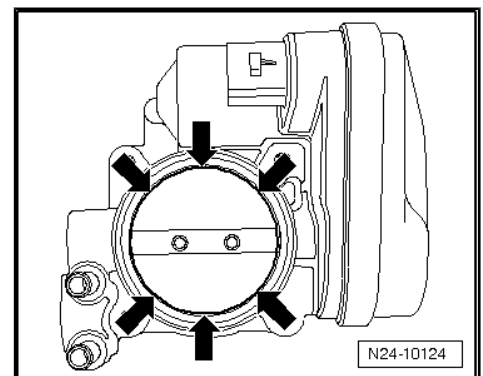
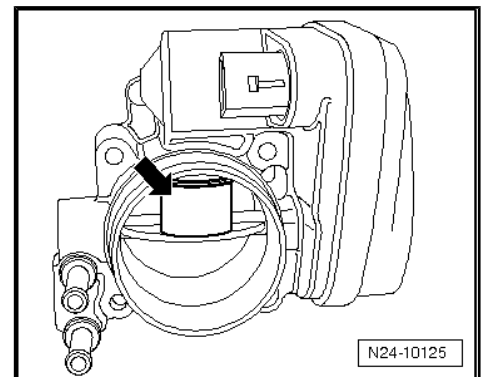
- ◆ *Safety precautions when working on the fuel supply system ➔ [page 3](#).*
- ◆ *Rules of cleanliness when working on the fuel supply system ➔ [page 5](#).*
- ◆ *If a new engine control unit -J623- is fitted, the throttle valve control unit must be adapted. The adaptation must only be carried out with a new or cleaned throttle valve control unit, because dirt/carbon deposits in the end stop of the throttle valve can lead to incorrect adaptation values.*
- ◆ *The throttle valve support must not be scratched when cleaning.*
- Remove the throttle valve control unit ➔ [page 157](#).
- Open the throttle valve manually and block the throttle valve in the opened position with a suitable object (e.g. plastic or wooden wedge)-arrow-



WARNING

Acetone is easily inflammable. Observe the accident prevention regulations and the safety instructions when handling easily inflammable fluids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel.

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- Thoroughly clean the throttle valve support, in particular the area of the closed throttle valve -arrows-, with commercially available acetone and a paint brush.
 - Wipe the throttle valve support with a fluffy cloth.
 - Let the acetone dry off completely and re-install the cleaned throttle valve control unit.



2.4 Removing and installing intake manifold

Special tools and workshop equipment required

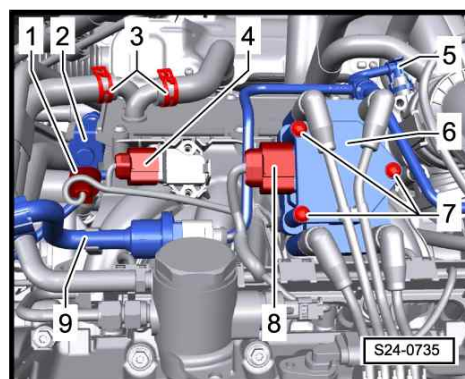
- ◆ Pliers for spring strap clamps
- ◆ Hose clamps up to Ø 25 mm -MP7-602 (3094)-

Removing



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.
- Remove the throttle valve control unit ⇒ [page 157](#).
- Disconnect the fuel intake hose -9- and the plug from the activated charcoal filter system solenoid valve 1 -N80- and remove the valve from the intake manifold.
- Disconnect plugs -1- and -4-.
- Release the fixing screws -7- and carefully place the ignition transformer -N152- -6- onto the cylinder head cover.
- Detach connecting hose -5- from intake manifold.
- Disconnect the vacuum line of the solenoid valve for coolant circuit -N492- -2- from the coolant pump.
- Pinch off coolant hoses for charge-air cooler with hose clamps -MP7-601-.
- Slacken the clamps -3- and detach the coolant hoses from the charge-air cooler.
- Slacken the fixing screws -arrows- crosswise and carefully remove the intake manifold upwards.



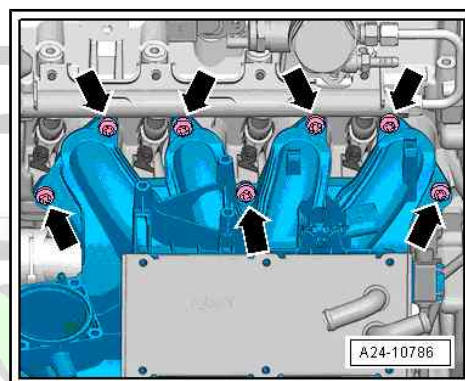
Note

Pour the residual coolant out of the charge air cooler into a collecting tank.

Install

Installation is carried out in the reverse order.

- ◆ Tightening torque of fixing screws for intake manifold: 20 Nm
- ◆ Tightening torque and tightening sequence for charge-air cooler: ⇒ [page 149](#)
- Check, top up and bleed cooling system ⇒ [page 99](#).



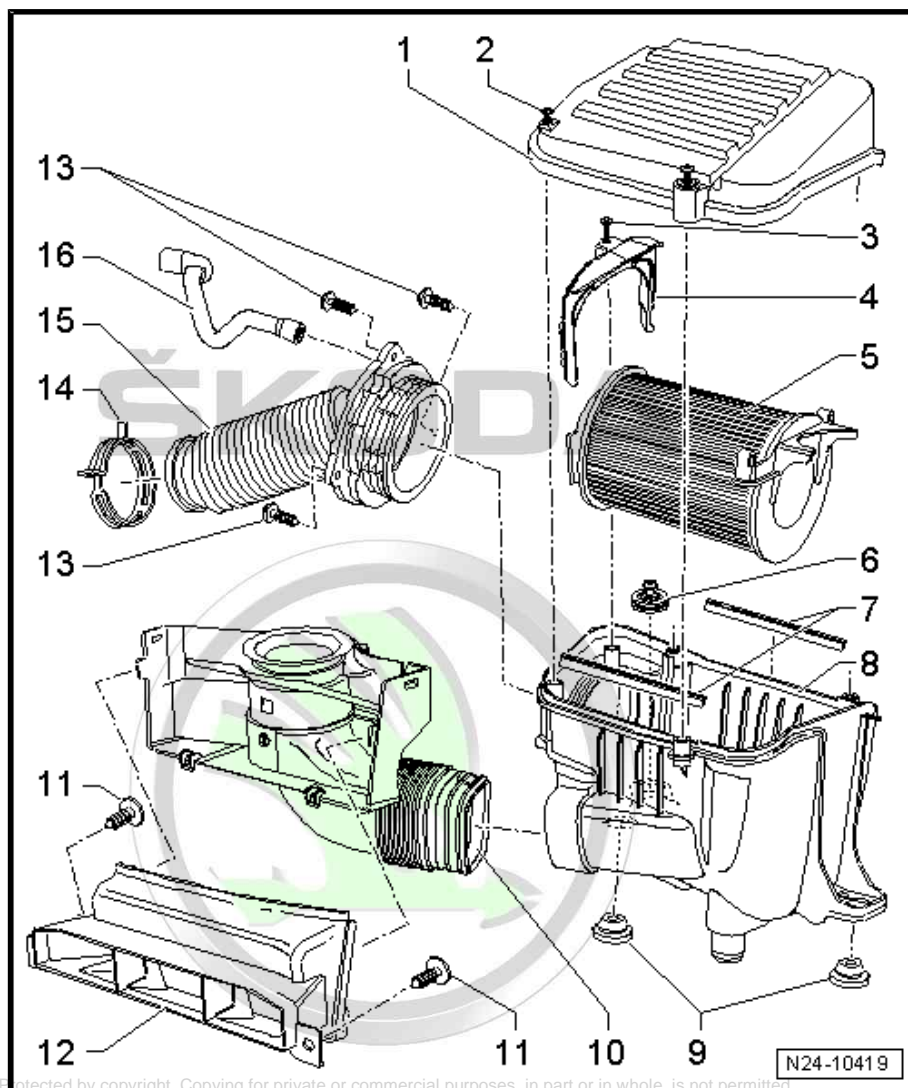


3 Air filter

3.1 Air filter - Summary of components

Removing and installing air filter ⇒ [page 161](#) .

- 1 - Air filter top part
- 2 - 2 Nm
- 3 - 2 Nm
- 4 - Support
- 5 - Filter element
- 6 - Rubber-metal bearing, 8 Nm
 - ☐ with captive screw
- 7 - Seals
 - ☐ replace if damaged
- 8 - Air filter bottom part
 - ☐ removing and installing
⇒ [page 161](#)
- 9 - Rubber bearing
- 10 - Inlet connection
 - ☐ with cover
- 11 - 2 Nm
- 12 - Intake air duct
- 13 - 2 Nm
- 14 - Spring strap clamp
 - ☐ use spring strap clips ,
e.g. -VAS 6340- for re-
moving and installing -
VAS 6340-
- 15 - Suction hose
- 16 - Vacuum hose
 - ☐ replace if damaged
 - ☐ to cylinder head cover



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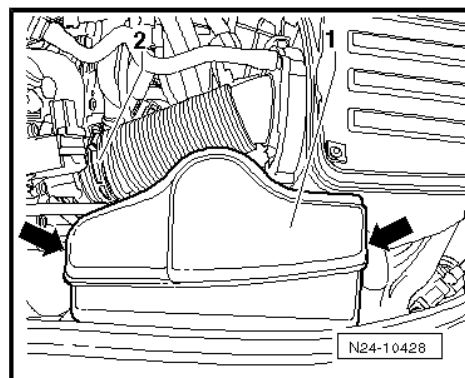
3.2 Removing and installing air filter

Special tools and workshop equipment required

- ◆ Pliers for spring strap clamps

Removing

- Press the catches -arrows- and take the cover -1- from the inlet connection.
- Pull the inlet connection out of the intake air duct.
- Remove the spring strap clamp -2- with the intake hose from the exhaust gas turbocharger.

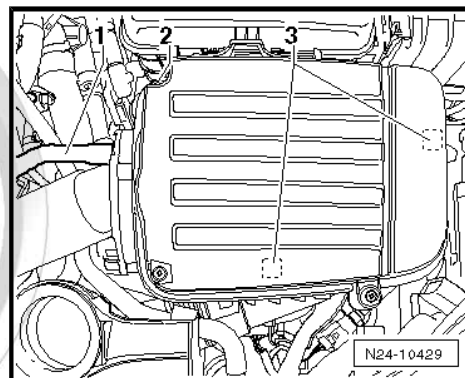
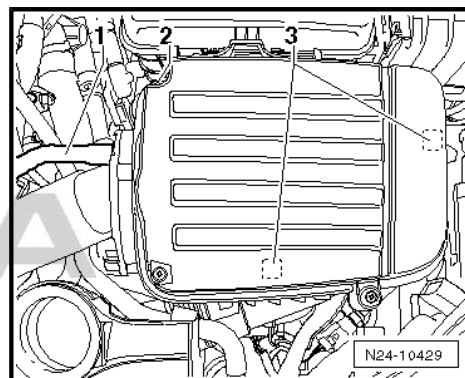


- Detach vacuum hose -1- from air filter housing.
- Unscrew the fixing screw -2- and pull the air filter housing towards the top from the bearing bolts -3-.

Install

Installation is carried out in the reverse order. Pay attention to the following:

- Press the air filter housing from the top onto the bearing bolts -3-.
- Tighten fixing screw -2- to 8 Nm.
- Fit the vacuum hose -1- at the connection fitting of the air filter housing.



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4 High pressure pump

4.1 High pressure pump - Summary of components



WARNING

The injection system consists of a high pressure part (maximum 12 MPa/120 bar) and a low pressure part (approx. 0.6 MPa/6 bar).

Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system" ➔ [page 4](#).

1 - 15 Nm

2 - Fuel hose

- ☐ Low pressure
- ☐ with spring strap clamp

3 - Spring strap clamp

4 - Union nut, 25 Nm

- ☐ hold the connection fitting on the high pressure pump for loosening

5 - Union nut, 25 Nm

- ☐ hold the connection fitting on the high pressure pump for loosening

6 - High pressure pump with fuel pressure regulating valve - N276-

- ☐ removing and installing ➔ [page 164](#)

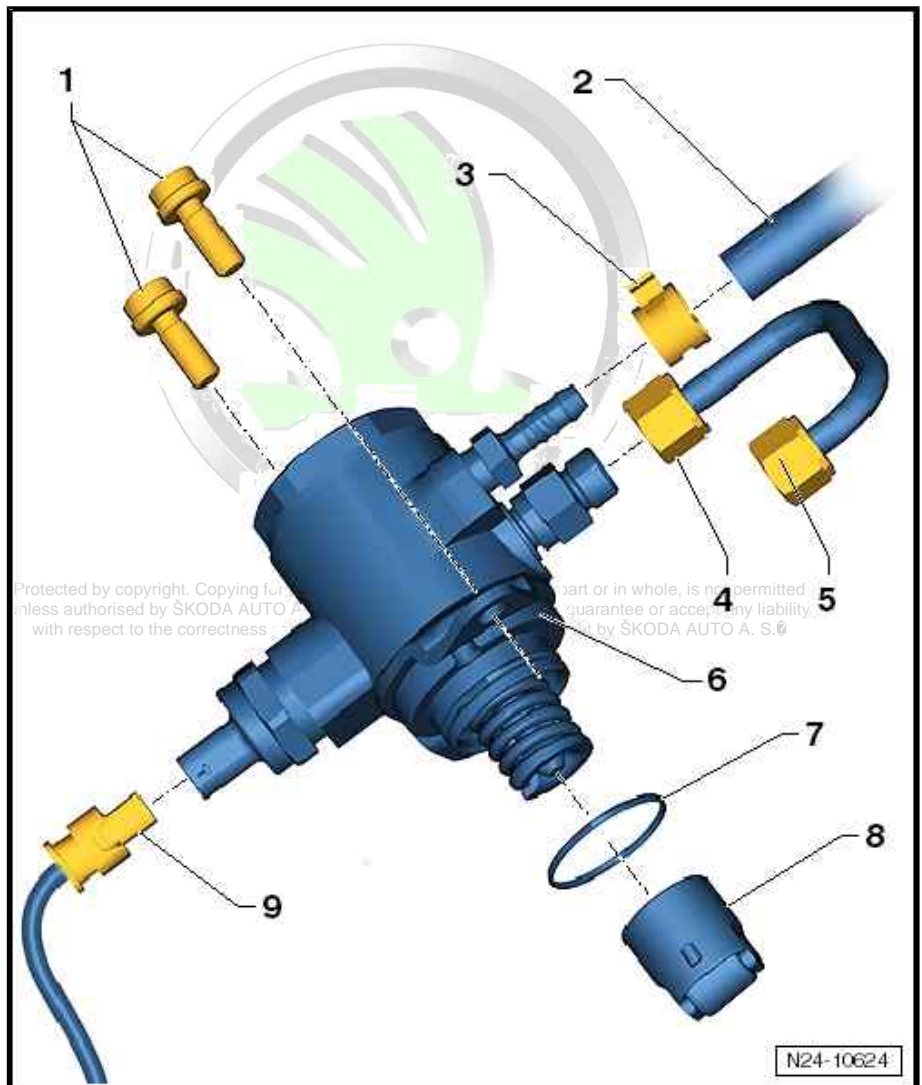
7 - O-ring

- ☐ replace
- ☐ before fitting moisten lightly with clean engine oil

8 - Roller tappet

- ☐ before fitting moisten lightly with clean engine oil

9 - Connector





4.2 Removing and installing the high pressure pump

Special tools and workshop equipment required

- ◆ Pliers for spring strap clamps

Condition

- The engine must be cold.

Removing



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.



WARNING

The injection system consists of a high pressure part (maximum 12 MPa/120 bar) and a low pressure part (approx. 0.6 MPa/6 bar).

Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system" ⇒ [page 4](#).

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- Disconnect the plug -1- and the fuel feed line -2- from the high pressure pump.

i Note

Collect the fuel which flows out with a cleaning cloth.

- Slacken the union nuts -3- at the high pressure line.

i Note

Hold the screwed connections at the high pressure pump and at the fuel distributor when slackening the union nuts with a wrench.

- Uniformly release the fixing screws -4- and remove the high pressure pump with roller tappet from the cylinder head cover.

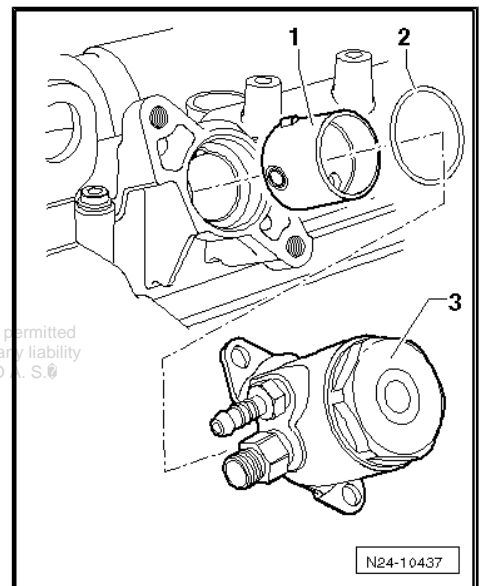
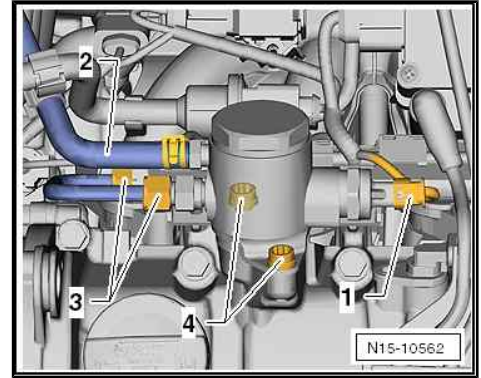
Install

i Note

- ◆ *Moisten the roller tappet of the high pressure pump with clean engine oil.*

- ◆ *Always replace the O-ring of the high pressure pump.*

- Slide the roller tappet -1- into the camshaft housing.
- Insert a new, oiled O-ring -2- into the slot of the high pressure pump -3-.
- Position the high pressure pump -3- on the cylinder head cover.



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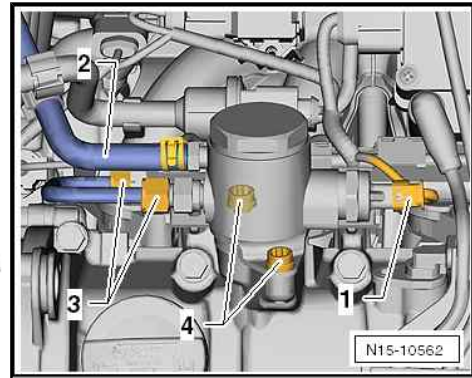
- First of all screw in the fixing screws -4- sufficiently until the bolt heads are positioned on the flange.
- Then tighten the fixing screws -4- evenly.
Tightening torque: 20 Nm
- Screw on the union nuts of the high pressure line -3- by hand.

**Note**

Hold the screwed connections at the high pressure pump and at the bottom part of intake manifold/fuel distributor when tightening the union nuts with a wrench.

- Tighten the union nuts -3- at the high pressure line to 25 Nm.
- Attach the fuel feed line -2- and the plug -1- on the high pressure pump.

The further assembly is carried out in reverse order to disassembly.



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5 Injection valves

5.1 Removing and installing injection valves

Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- ◆ *Observe the safety instructions before starting fitting work*
⇒ [page 5](#).

Note

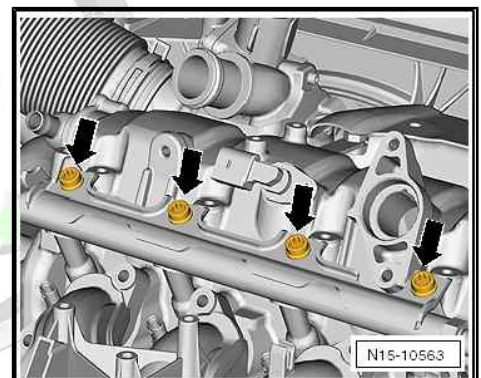
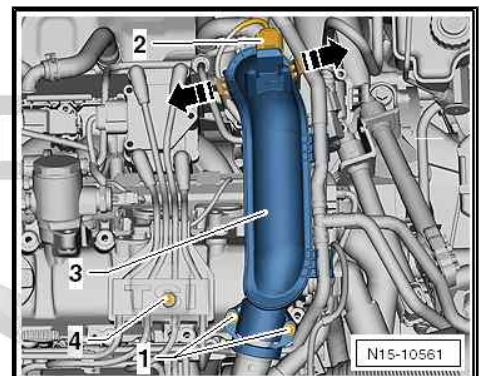
The Teflon gasket ring on the injection valve must be replaced each time after removing the injection valve ⇒ [page 169](#).

Special tools and workshop equipment required

- ◆ Set of tools -T10133-

Removing

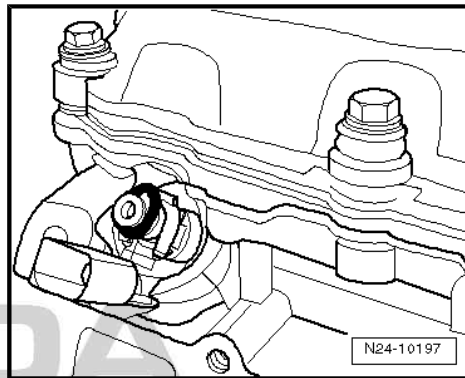
- Release screws -1- and remove retaining clip.
- Disconnect plug -2- at charge pressure sender -G31- with intake air temperature sender 2 -G299-.
- Release the catches in -direction of arrow- and detach the pressure pipe -3- first of all from the throttle valve control unit -J338 - and then from the exhaust gas turbocharger.
- Remove the high pressure pump ⇒ [page 164](#).
- Release the fixing screws -arrows- and carefully remove the fuel distributor from the injection valves.



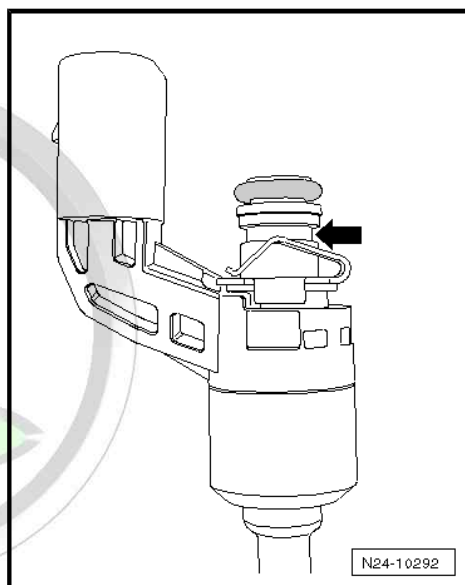
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- Press the O-ring upwards by hand as shown and remove it from the injection valve.
- Screw the striking hammer -T10133/3- with the extractor -T10133/15-.

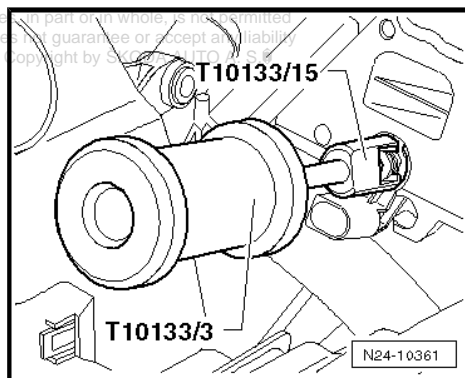


- Then insert the extractor -T10133/15- into the groove -arrow- on the injection valve.

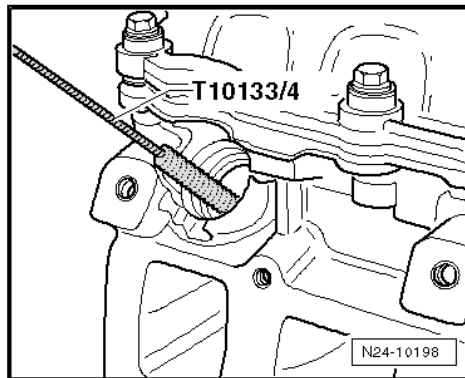


- Pull out the injection valve with careful knocks.

Install



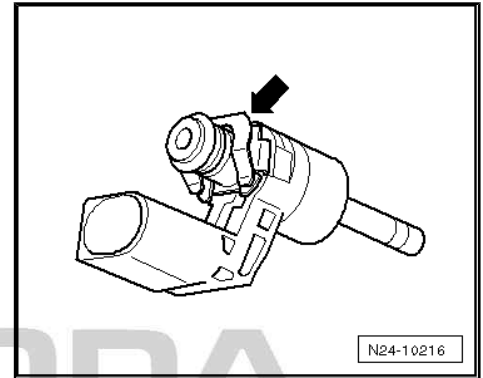
- Thoroughly clean the holes of the injection valves in the cylinder head with the nylon brush -T10133/4-.
- Check the supporting washer made of plastic for damage, replace if necessary ⇒ [page 169](#).



- Replace the spring element -arrow- as well as the Teflon gasket ring each time after removing the injection valves
⇒ [page 169](#) .
- Replace O-rings between injection valve and bottom part of the intake manifold/fuel distributor and moisten lightly with clean engine oil.

i Note

- ◆ *The Teflon gasket ring of the injection valve must neither be oiled nor greased.*
- ◆ *The injection valve must insert easily, if necessary wait until the gasket ring has been drawn together sufficiently.*

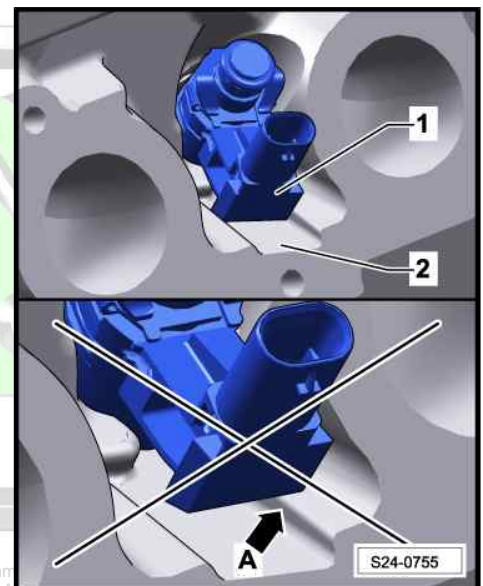


- Press the injection valve -1- by hand up to the stop into the hole of the cylinder head. The injection valve should be pressed evenly into the countersink -2- on the cylinder head.

i Note

- ◆ *The injection valve must never rest against the countersink edge on the cylinder head -arrow A-, but it must always be pressed evenly into the countersink -2- on the cylinder head.*
- ◆ *After installing, carry out a visual inspection of the fitting location of the injection valve.*

Further installation occurs in a similar way in reverse order to removal.



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5.2 Replace Teflon gasket ring and supporting washer at injection valve

i Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#) .
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#) .

Special tools and workshop equipment required

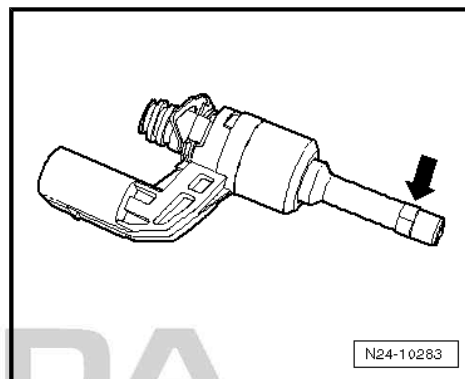
- ◆ Set of tools -T10133-

Work procedure

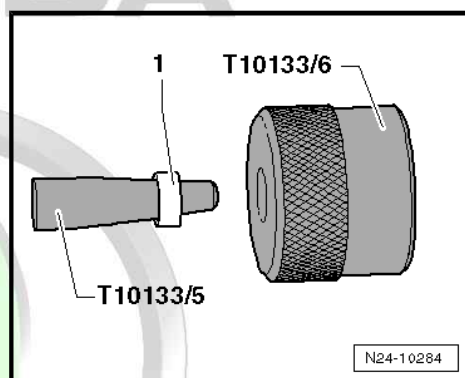
Replace Teflon gasket ring

- Remove injection valves ⇒ [page 167](#) .
- Carefully clean the injection valve.

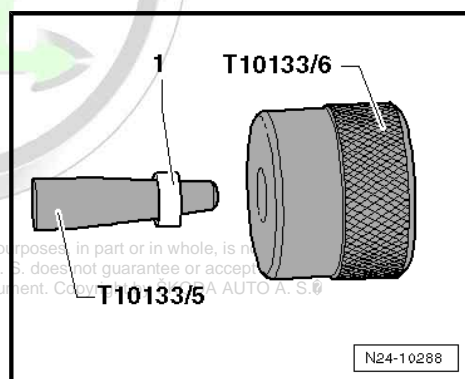
- Carefully cut open the gasket ring with a knife as shown -arrow-. Absolutely try to avoid the contact of the knife blade with the valve body.
- Remove the old gasket ring and clean the gasket ring nut in the area of the gasket ring -arrow-. Remove the existing deposits (carbon deposits) with a wire brush.



- Fit a new gasket ring -1- onto the assembly cone -T10133/5-. Slightly push the gasket ring with the assembly sleeve -T10133/6- (knurling points to the gasket ring -1-) as far as possible onto the assembly cone -T10133/5-.

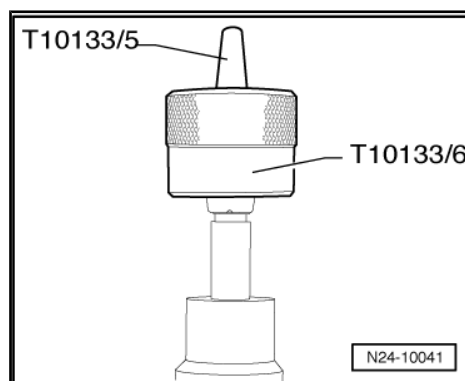


- Turn the assembly sleeve -T10133/6- around (now the knurling points away from the gasket ring), and push the gasket ring -1- up to the end onto the assembly cone -T10133/5-.
- Now position the assembly cone -T10133/5- with the gasket ring from the front onto the injection valve. Push the gasket ring with the assembly sleeve -T10133/6- further onto the injection valve.

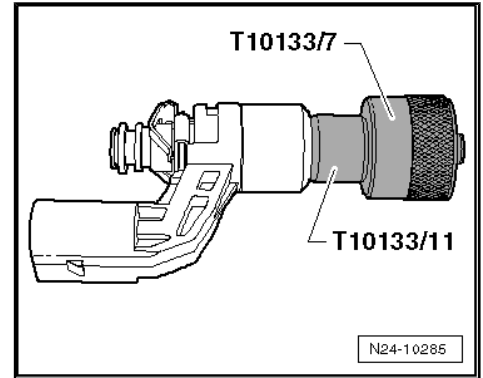


The gasket ring is not yet seated in its groove.

- Remove the assembly sleeve -T10133/6- and the assembly cone -T10133/5-.
- Push the gasket ring by hand into the annular groove.
- Fit the spacer sleeve -T10133/11- onto the valve body.



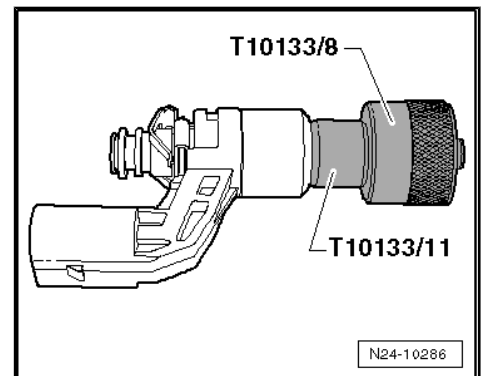
- Now press the calibration sleeve - T10133/7- via the gasket ring up to the stop at the spacer sleeve -T10133/11- .
- Pull off again the calibration sleeve -T10133/7- .



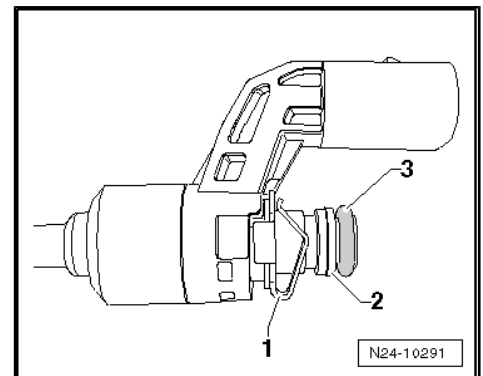
- Now press the calibration sleeve - T10133/8- via the gasket ring up to the stop at the spacer sleeve -T10133/11- .
- Pull off again the calibration sleeve -T10133/8- .

Now the Teflon gasket ring has its correct fitting dimension.

Replace supporting washer

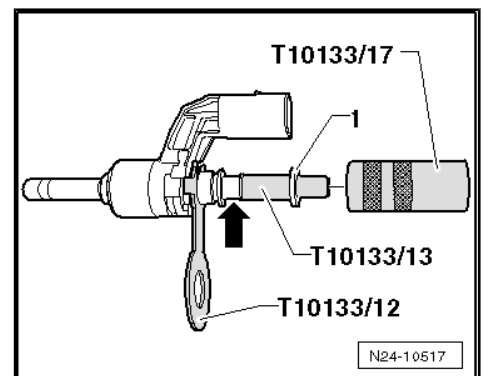


- Remove O-ring -3-.
- Cut open the supporting washer -2- with a small side cutter and take it off.
- Pull off the spring element at the injection valve -1- and instead push on the lock washer -T10133/12 - .



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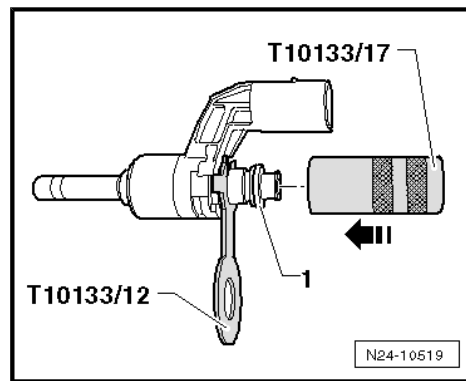
- Mount a new supporting washer -1- on the assembly cone - T10133/13- and fit it onto the injection valve as shown.
- Push the supporting washer -1- with the calibration sleeve - T10133/17- (knurled side points to the injection valve) up to the first nut -arrow- onto the injection valve.



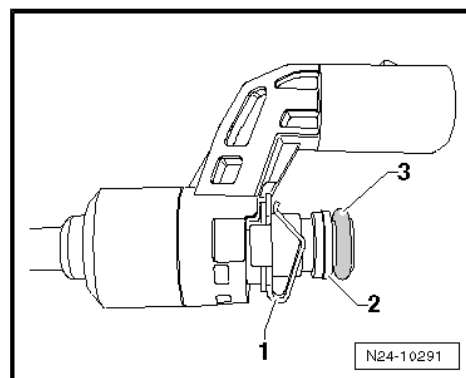


- Now turn the calibration sleeve -T10133/17 - around (knurled side points away from the injection valve). Push the calibration sleeve via the supporting washer -1- in -direction of arrow- up to the stop on the lock washer -T10133/12- .
- Pull off again the calibration sleeve -T10133/17- .

Now the supporting washer has its correct fitting dimension.



- Now fit a new spring element -1- for the lock washer -T10133/12 - and push a new O-ring -3- in front of the supporting washer -2-.

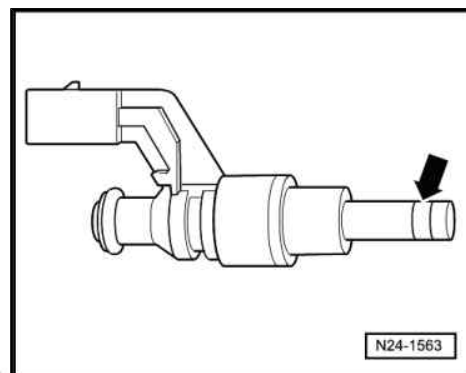


Note

The Teflon gasket ring -arrow- must not be oiled when installing the injection valve.

- Install injection valves ⇒ [page 167](#) .

Further installation occurs in reverse order to removal.



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6 Testing components

6.1 Check fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-
- ◆ Open ring spanner with 3/8" drive, wrench size 27 mm
- ◆ Pressure sensor tester , e.g. -VAS 6394- (includes digital manometer -VAS 6394/1-)
- ◆ Adapter , e.g. -VAS 6394/3-
- ◆ Test adapter , e.g. -VAS 5570-
- ◆ Vehicle diagnosis, measurement and information system - VAS 5051-



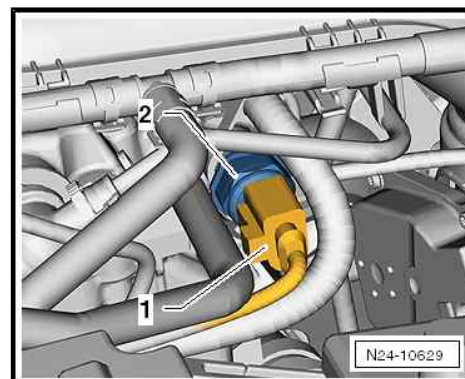
WARNING

The injection system consists of a high pressure part (maximum 12 MPa/120 bar) and a low pressure part (approx. 0.6 MPa/6 bar).

Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system" ⇒ [page 4](#) .

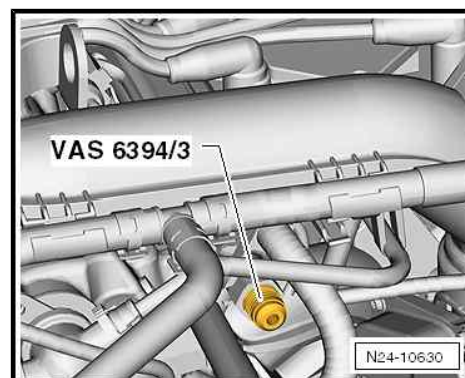
Work procedure

- Disconnect the plug -1- and remove the fuel pressure sender -G247- -1- with the wrench.



- Moisten the sealing cone of the adapter -VAS 6294/3- with clean engine oil and screw it into the fuel distributor.

Tightening torque: 22 Nm

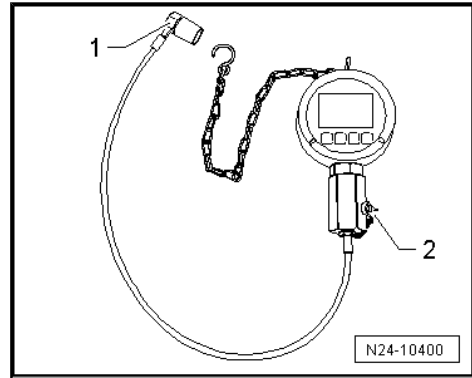




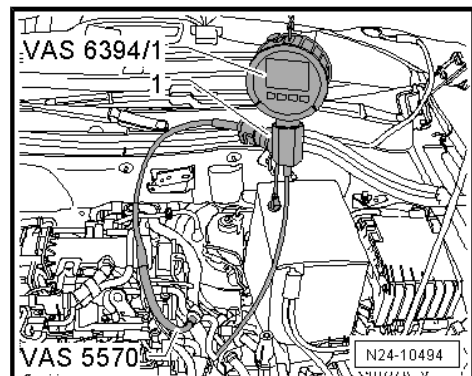
- Unscrew the screw plug -2- and screw the fuel pressure sender -G247- into the tester -VAS 6394/1- .

Tightening torque: 22 Nm

- Screw the pressure line -1- of the digital manometer -VAS 6394/1- by hand onto the adapter -VAS 6394/3- .



- Connect the test adapter -VAS 5570- to the fuel pressure sender -G247- -1- and to the plug.

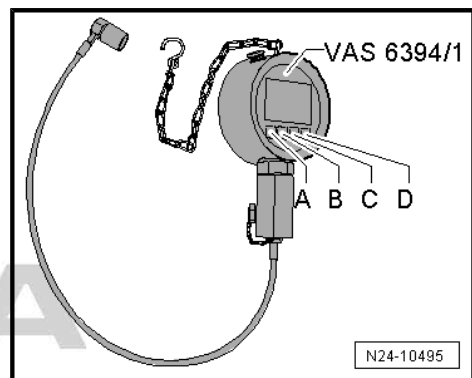


- Switch on the tester -VAS 6394/1 - , for this step, briefly press the button -A- once.



Note

- ◆ If the button -A- is pressed for 2 seconds, the illumination is switched on for 20 seconds.
- ◆ If the tester -VAS 6394/1- does not indicate 0 MPa (0 bar), carry out a zero point of the balance by means of the ⇒ operating instructions .



- Connect the vehicle diagnosis, measurement and information system -VAS 5051- -1- to the diagnostic connection.
- Switch on ignition.
- On the display press consecutively the following buttons:

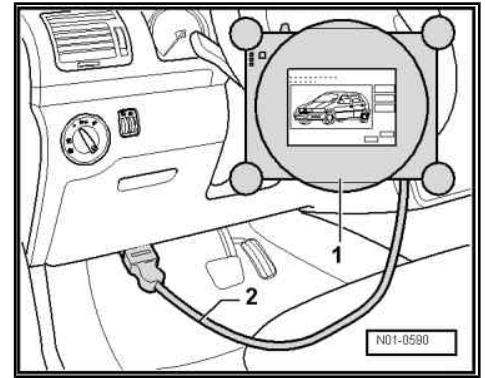
Vehicle self-diagnosis

Self-diagnosis [?]

01 - Engine Electronics [?]

011 - Measured values [?]

- Select measured value block [1] [4] [0] and confirm with the key [Q].



The actual value which is transmitted to the vehicle by the fuel pressure sender -G247- is shown in the display field 3.

- Start engine.
- Compare the displayed pressure on the digital manometer -VAS 6394/1- with the actual value on the vehicle diagnosis, measurement and information system -VAS 5051- .
- The pressures may deviate maximum 0.5 MPa (5 bar) from one another.

If the deviation is greater than 0.5 MPa (5 bar):

- Perform a vehicle diagnosis, measurement and information system -VAS 5051- of the guided function "remove high fuel pressure".
- Replace fuel pressure sender -G247- .
- Repeat the test with the new fuel pressure sender -G247- and compare both measured values.

If the measured values do not correspond again:

- Perform a cable testing ⇒ Vehicle diagnosis, testing and information system VAS 5051.

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7 Engine control unit

7.1 Removing and installing engine control unit

Special tools and workshop equipment required

- ◆ Body saw, e.g. -V.A.G 1523 A-



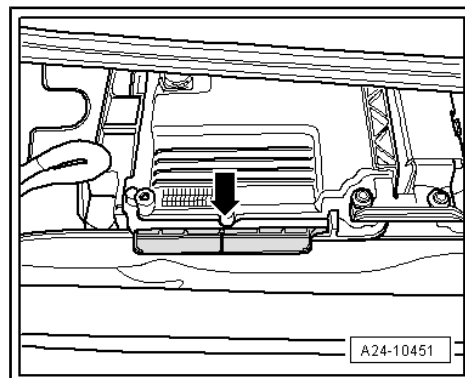
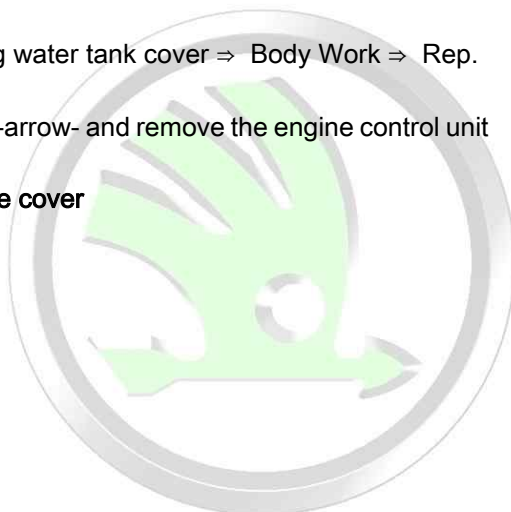
Note

- ◆ *In order to be able to unplug the plugs from the control unit, the control unit must always be removed.*
- ◆ *If the engine control unit is replaced, connect the vehicle diagnosis, measurement and information system - VAS 5051- and carry out the function "replace engine control unit".*

Removing

- Switch off ignition.
- Remove the cooling water tank cover ⇒ Body Work ⇒ Rep. Gr. 66 .
- Open retaining clip -arrow- and remove the engine control unit -J623 - .

Vehicles with protective cover



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- Cut with body saw a slot for the cross-head screwdriver in the heads of the pull-off screws -3 and 4-.

i Note

- ◆ *It must be sawed twice with the body saw, so that the slot is wide enough, in order to be able to unscrew the screws with a suitable screwdriver.*
- ◆ *The pull-off screws until are inserted with locking agent.*
- Unscrew the screws and remove the protective cover for plug connections -2 and 5-.

Continued for all vehicles

- Disconnect both plugs at engine control unit and unplug.

Install

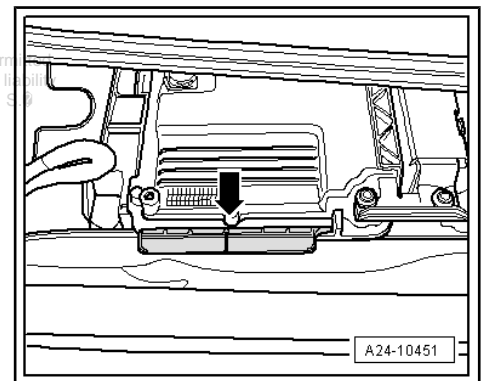
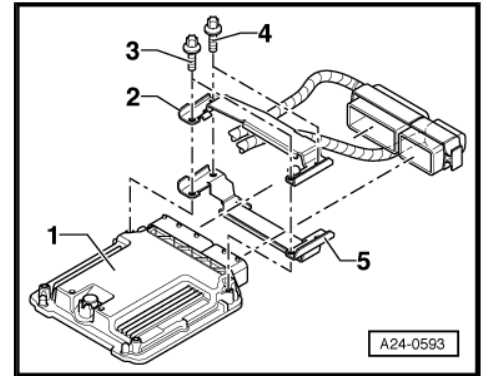
- Connect both plugs and lock.

Vehicles with protective cover

- Fasten protective cover with new pull-off screws.
- Tighten pull-off screws evenly until the screw heads are pulled off.

Continued for all vehicles

- Push engine control unit into the bracket and lock with retaining clip -arrow-.
- Install water box cover ➔ Body Work ➔ Rep. Gr. 66



26 – Exhaust System

1 Removing and installing parts of the exhaust system

1.1 Catalytic converter and component parts - Summary of components

1 - Lambda probe -G39-, 50 Nm

- ☐ the thread of new lambda probes must be coated with assembly paste
- ☐ for re-used lambda probe, only coat the thread with hot bolt paste -G 052 112 A3-; the paste must not get into the slots of the probe body

2 - 23 Nm

- ☐ replace
- ☐ Coat pin screws of exhaust manifold with exhaust gas turbocharger using hot bolt paste -G 052 112 A3-
- ☐ pay attention to mounting instructions and order for tightening
⇒ [page 179](#)

3 - Catalytic converter with exhaust pipe

- ☐ pay attention to mounting instructions and order for tightening
⇒ [page 179](#)

4 - Gasket

- ☐ replace

5 - Gasket

- ☐ replace

6 - Intermediate pipe

7 - Double clamp, 23 Nm

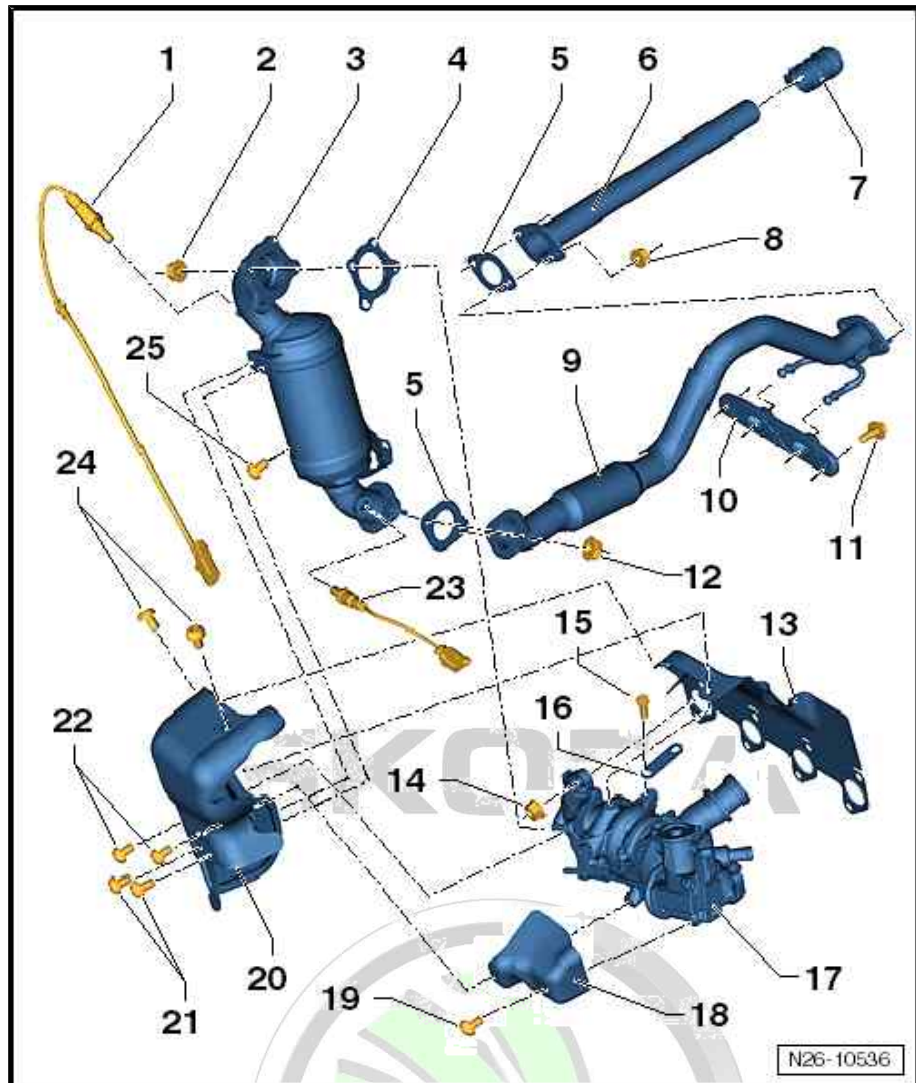
- ☐ Tighten bolted connections evenly

8 - 25 Nm

- ☐ replace

9 - Exhaust pipe

- ☐ with decoupling element
- ☐ do not twist decoupling element more than 10° - risk of damage
- ☐ secure the decoupling element with the transport device -T10403- against overtensioning and flexion



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10 - Hanger

11 - 25 Nm

12 - 25 Nm

- ☐ replace

13 - Gasket

- ☐ replace

14 - 25 Nm

- ☐ replace

- ☐ Coat pin screws of exhaust pipe with hot bolt paste -G 052 112 A3-

15 - 20 Nm

16 - Support

17 - Exhaust gas turbocharger

- ☐ removing and installing ⇒ [page 144](#)
- ☐ The exhaust gas turbocharger with charge pressure regulator -V465- and exhaust manifold can only be replaced together

18 - Heat shield

19 - 10 Nm

- ☐ first of all screw in all fixing screws by hand when installing

20 - Heat shield

21 - 10 Nm

22 - 10 Nm

23 - Lambda probe downstream of catalytic converter -G130- , 50 Nm

- ☐ the thread of new lambda probes must be coated with assembly paste
- ☐ for re-used lambda probe, only coat the thread with hot bolt paste -G 052 112 A3- ; the paste must not get into the slots of the probe body

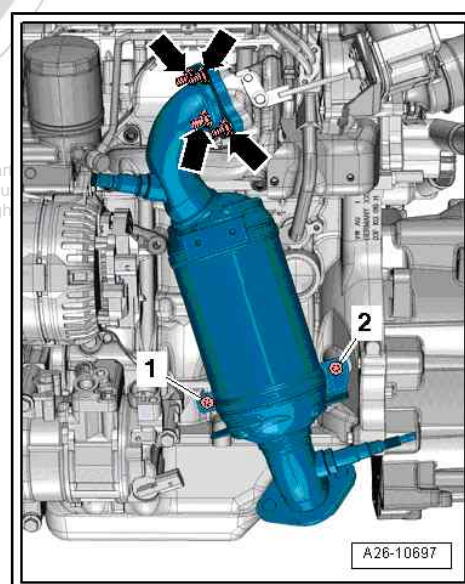
24 - 10 Nm

25 - 25 Nm

Catalytic converter with exhaust pipe - mounting instructions and sequence for tightening

Tighten nuts and screws in 4 stages:

Stage	Screws/nuts	Tightening torque
1.	-Arrows-	Tighten nuts by hand up to contact surface.
2.	-1-	25 Nm
3.	-2-	25 Nm
4.	-Arrows-	23 Nm





1.2 Middle and rear silencer - Summary of components

1 - From pre-exhaust pipe with catalytic converter

2 - Hanger

- ☐ replace if damaged

3 - Retaining strap

- ☐ replace if damaged

4 - 23 Nm

5 - Double clamp

- ☐ Tighten bolted connections evenly
- ☐ Fitting position
⇒ [page 180](#)

6 - 23 Nm

7 - Rear silencer

- ☐ for first equipment building unit with middle silencer; replace individually when carrying out repairs
- ☐ Align exhaust system free of stress
⇒ [page 181](#)
- ☐ Separate the exhaust system ⇒ [page 180](#)

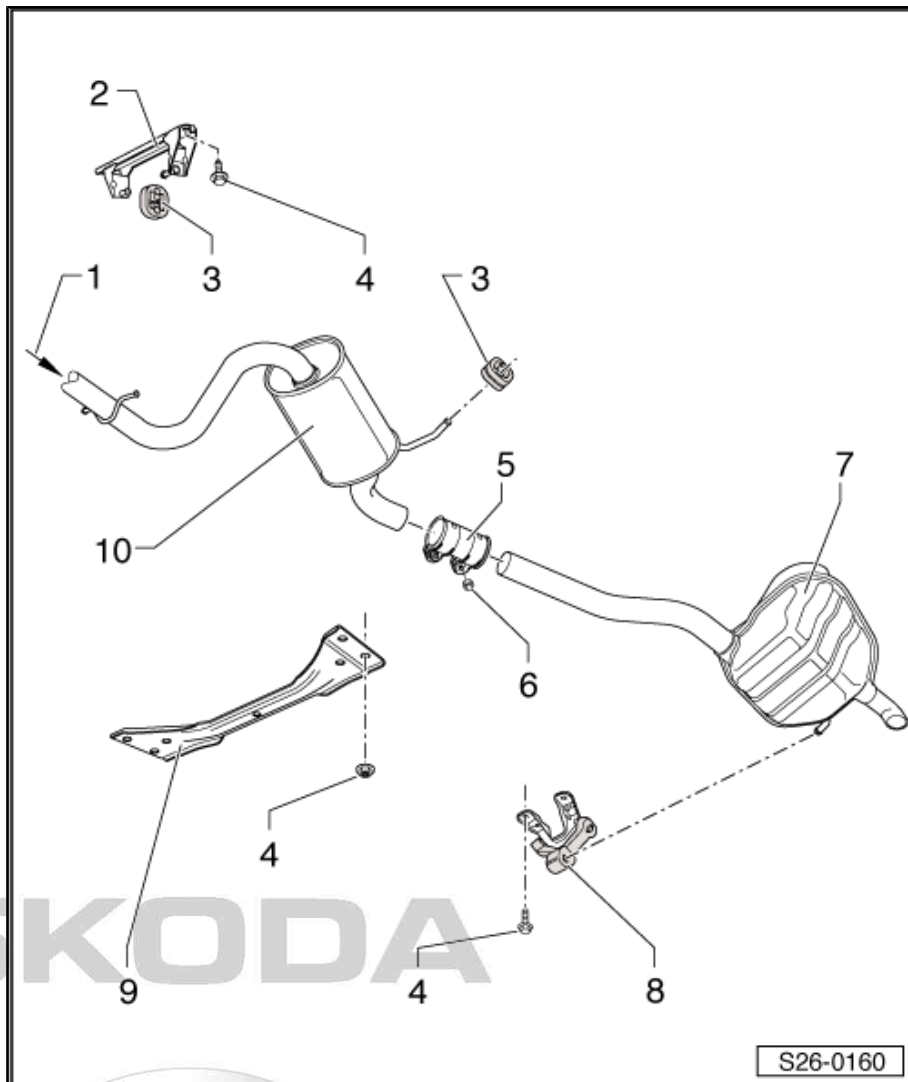
8 - Hanger

- ☐ replace if damaged

9 - Tunnel bridge

10 - The middle silencer

- ☐ for first equipment building unit with rear silencer; replace individually when carrying out repairs
- ☐ Align exhaust system free of stress ⇒ [page 181](#)
- ☐ Separate the exhaust system ⇒ [page 180](#)



S26-0160

1.3 Replacing middle or rear silencer

Special tools and workshop equipment required

- ◆ Body saw e.g. -V.A.G 1523 A -
- ◆ Protective goggles



Note

- ◆ For individually replacing the front or rear silencer, a separation point is provided in the connecting pipe.
- ◆ The separation point is marked by indentations on the circumference of the exhaust pipe.

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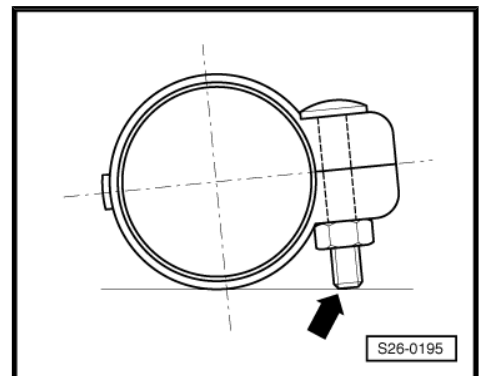
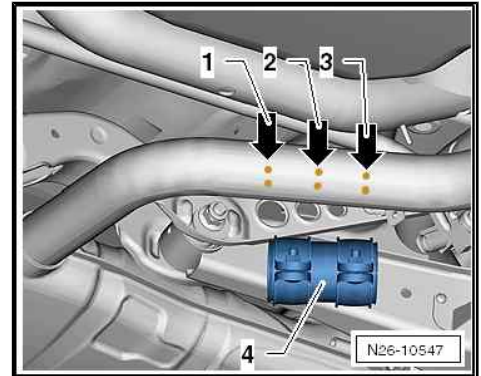
WARNING

In order to avoid injuries because of metal swarfs, wear safety goggles and safety clothing.

- Separate exhaust pipe at right angles at the separation point -arrow 2- with body saw.
- When installing, position double clamp -4- at the side markings -arrow 1- and -arrow 3-.

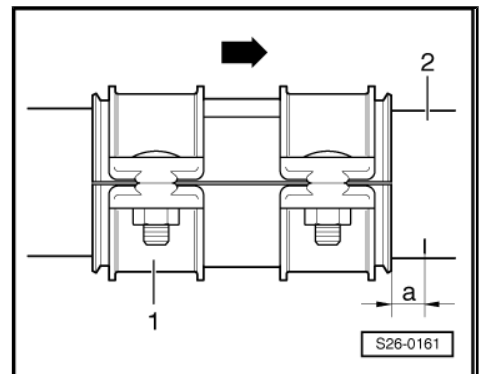
SKODA

- Turn the double clamp in such a way that the ends of the screws -arrow- do not protrude beyond the bottom edge of the double clamp.
- Align the rear silencer horizontally and tighten the double clamp to 23 Nm.
- Align exhaust system in cold condition free of stress
⇒ [page 181](#).



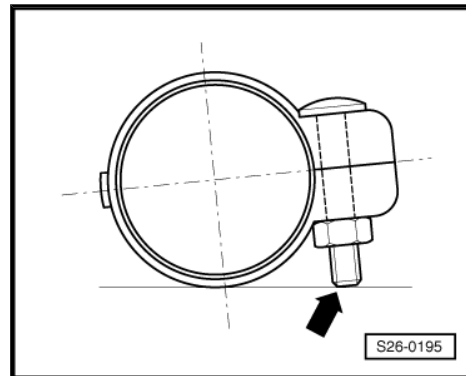
1.4 Aligning exhaust system free of stress

- The exhaust system is aligned when cold.
- Slacken the nuts at the double clamp -1- and align the intermediate pipe -2- (-arrow- points in direction of travel).
-a- = 5 mm

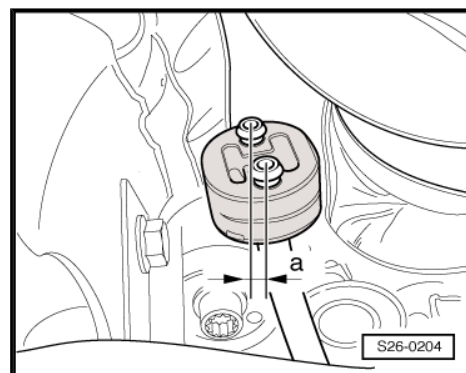


The fixing screws must be located on the right. The screws must not protrude beyond the bottom edge of the double clamp -arrow-.

- Tighten the front nut by hand.

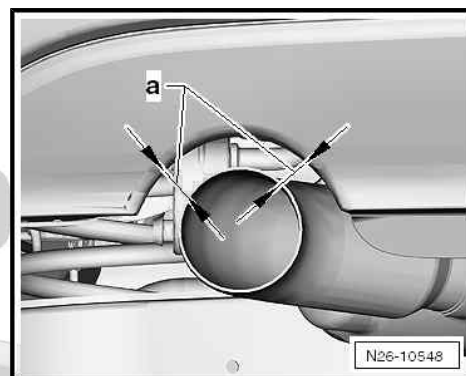


- Push the exhaust system so far forward until the dimension -a- of 7...9 mm is achieved between hanger/body and hanger/middle silencer.
- Tighten bolted connections of the double clamp evenly to 23 Nm.



Align exhaust tailpipes

- Align rear silencer in such a way that there is an equal distance -a- right and left between bumper opening and exhaust tailpipe.
- For centering the exhaust tailpipe, if necessary loosen the suspension of the rear silencer.



1.5 Inspecting the exhaust system for leak-tightness

- Start engine and run in idle.
- Seal off exhaust tailpipes for the duration of the leak check (e.g. with cloth or plug).
- Inspect connection points of cylinder head/exhaust manifold, exhaust gas turbocharger/exhaust pipe etc. for tightness by listening and visual inspection.
- Eliminate any leak found.

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28 – Ignition system

1 Ignition system

1.1 Ignition system - Summary of components

1 - Cable guide

2 - 8 Nm

3 - Cover

4 - Connector

5 - Hall sender -G40-

6 - 10 Nm

7 - Ignition cable with spark plug connector

- ☐ Remove the spark plug connector from the spark plugs using the extractor -T10112 A- .

◆ D ignition transformer = ignition cable cyl. 1

◆ B ignition transformer = ignition cable cyl. 2

◆ C ignition transformer = ignition cable cyl. 3

◆ A ignition transformer = ignition cable cyl. 4

8 - Spark plug, 25 Nm



Note

- ◆ When installing new spark plug the spark plug connectors must be regreased with lubricating paste -G 052 141 A2-. In doing so, the sealing hose of the spark plug connector does not stick to the spark plug. The lubricating paste must spread over the spark plug when fitting on the spark plug connector
⇒ [page 184](#) .

- ◆ The new spark plug cables are supplied greased.

9 - Knock sensor 1 -G61-

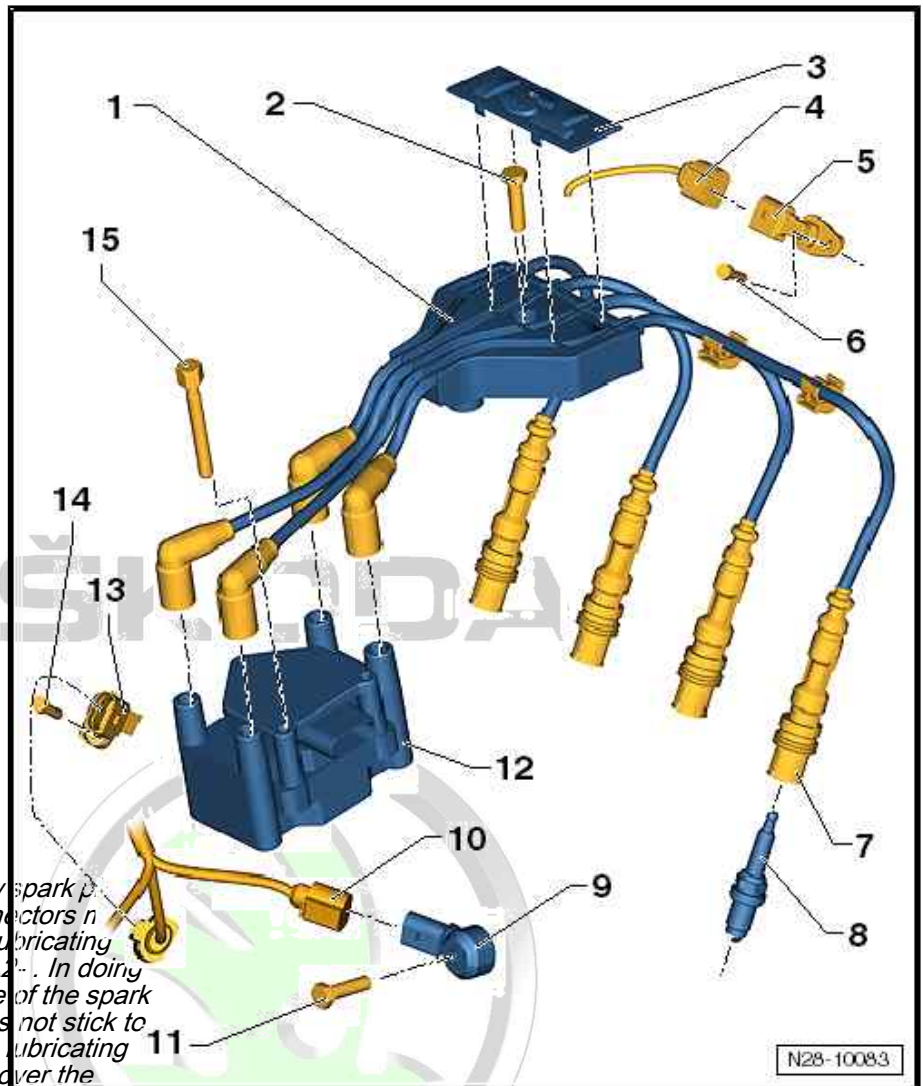
- ☐ at rear cylinder block

- ☐ 20 Nm

10 - Connector

11 - 20 Nm

- ☐ The tightening torque influences the knock sensor function



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12 - Ignition transformer -N152-

- ◆ D ignition transformer = ignition cable cyl. 1
- ◆ B ignition transformer = ignition cable cyl. 2
- ◆ C ignition transformer = ignition cable cyl. 3
- ◆ A ignition transformer = ignition cable cyl. 4

13 - Engine speed sender -G28-

- removing and installing ➔ [page 184](#)

14 - 5 Nm

15 - 7 Nm

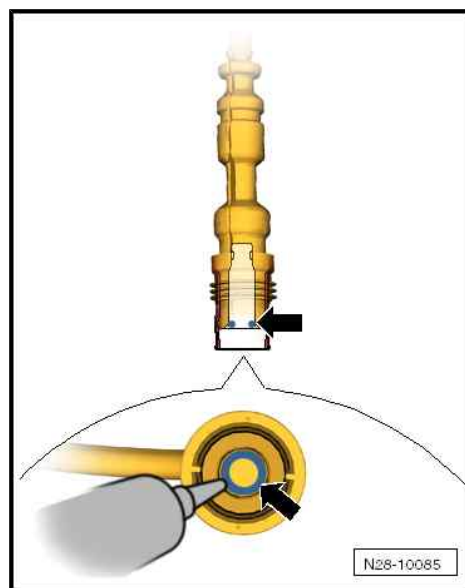
Grease spark plug connector



Note

The new spark plug cables are supplied greased.

- Apply a thin bead of lubricating paste G 052 141 A2 all around the sealing hose of the spark plug connector -arrow-. The bead must be 1...2 mm thick.



1.2 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

- ◆ Socket insert -T10370-

Removing

- Disconnect plug -arrow- from engine speed sender -G28- .
- Unscrew fixing screw for engine speed sender -G28- with socket insert -T10370 - .
- Remove engine speed sender -G28- from cylinder block.

Install

- Install engine speed sender -G28- and tighten the fixing screw to 5 Nm.

The further assembly is carried out in reverse order to disassembly.

